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04/02/01

Date: 4/5/01

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Leonard P. Guarente, Nicanor Austriaco, Jr., James J. Claus, Francesca Cole and Brian Kennedy

Title: GENES DETERMINING CELLULAR SENESCENCE IN YEAST

TRANSMITTAL OF SEQUENCE LISTING IN COMPUTER READABLE FORM IN COMPLIANCE WITH 37 C.F.R. §§1.821(e) AND (f)

Box Sequence
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Transmitted herewith is a copy of the "Sequence Listing" in computer readable form as required by 37 C.F.R. §1.821(e). As required by 37 C.F.R. §1.821(f), Applicants' Attorney hereby states that the content of the "Sequence Listing" in paper form and of the computer readable form of the "Sequence Listing" are the same.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

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Date: 4/5/01

SEQUENCE LISTING

<110> Guarente, Leonard P.
      Austriaco Jr., Nicanor
      Claus, James J.
      Cole, Francesca
      Kennedy, Brian

<120> GENES DETERMINING CELLULAR SENESCENCE IN
   YEAST

<130> 0050.1491-005

<150> US 08/396,001
<151> 1995-02-28

<150> PCT/US94/09351
<151> 1994-08-15

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<151> 1999-06-01

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Pro Arg Ser Lys Leu Ser Lys Asp Phe Lys Pro Gln Phe Thr Leu Leu
            15   20   25

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ttt tta ttt gaa tat aac caa cta cta gtc ctt cct tta aac aaa aat    543
Phe Leu Phe Glu Tyr Asn Gln Leu Leu Val Leu Pro Leu Asn Lys Asn
     60                  65                  70

tta ccc tcc ctt aat ttt tca aga aat tcc agt atg aaa tta tcc gct    591
Leu Pro Ser Leu Asn Phe Ser Arg Asn Ser Ser Met Lys Leu Ser Ala
75                  80                  85                  90

cta tta gct tta tca gcc tcc acc gcc gtc ttg gcc gct cca gct gtc    639
Leu Leu Ala Leu Ser Ala Ser Thr Ala Val Leu Ala Ala Pro Ala Val
                 95                 100                 105

cac cat agt gac aac cac cac cac aac gac aag cgt gcc gtt gtc acc    687
His His Ser Asp Asn His His His Asn Asp Lys Arg Ala Val Val Thr
                110                 115                 120

gtt act cag tac gtc aac gca gac ggc gct gtt gtt att cca gct gcc    735
Val Thr Gln Tyr Val Asn Ala Asp Gly Ala Val Val Ile Pro Ala Ala
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acc acc gct acc tcg gcg gct gct gat gga aag gtc gag tct gtt gct    783
Thr Thr Ala Thr Ser Ala Ala Ala Asp Gly Lys Val Glu Ser Val Ala
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gct gcc acc act act ttg tcc tcg act gcc gcc gcc gct act acc tct    831
Ala Ala Thr Thr Thr Leu Ser Ser Thr Ala Ala Ala Ala Thr Thr Ser
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gcc gcc gcc tct tct tcc tcc tct tcc tct tcc tcc tct tcc tct tct    879
Ala Ala Ala Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser
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tcc tct gtt ggt tct gga gat ttt gaa gat ggt acc att tcc tgt tct    927
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235                 240                 245                 250

aag acc caa tgg cct tct gaa caa cct tcc gat ggt aga tcc gtt ggt   1119
Lys Thr Gln Trp Pro Ser Glu Gln Pro Ser Asp Gly Arg Ser Val Gly
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ggt tta tac tgt aag aac ggt aaa tta tac cgt tcc aac acc gac act   1167
Gly Leu Tyr Cys Lys Asn Gly Lys Leu Tyr Arg Ser Asn Thr Asp Thr
                270                 275                 280
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        285                 290                 295

gtc tcc ggc tcc att gct atc tgt ggt acc gat tat cca ggt tct gaa    1263
Val Ser Gly Ser Ile Ala Ile Cys Gly Thr Asp Tyr Pro Gly Ser Glu
    300                 305                 310

aac atg gtc gtt cct acc gta gtt ggc gct ggt tcc tcc caa cca atc    1311
Asn Met Val Val Pro Thr Val Val Gly Ala Gly Ser Ser Gln Pro Ile
315                 320                 325                 330

aac gtc atc aag gag gac tcc tac tat caa tgg caa ggt aag aag acc    1359
Asn Val Ile Lys Glu Asp Ser Tyr Tyr Gln Trp Gln Gly Lys Lys Thr
            335                 340                 345

tct gcc caa tac tac gtt aac aac gct ggt gtc tct gtg gaa gat ggt    1407
Ser Ala Gln Tyr Tyr Val Asn Asn Ala Gly Val Ser Val Glu Asp Gly
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tgt atc tgg ggt act gag ggt tcc ggt gtc ggt aac tgg gcc cca gtt    1455
Cys Ile Trp Gly Thr Glu Gly Ser Gly Val Gly Asn Trp Ala Pro Val
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gtc ttg ggt gct ggt tac act gat ggt atc act tac ttg tcc atc att    1503
Val Leu Gly Ala Gly Tyr Thr Asp Gly Ile Thr Tyr Leu Ser Ile Ile
    380                 385                 390

cca aac cca aac aac aaa gaa gca cca aac ttt aac atc aag atc gtt    1551
Pro Asn Pro Asn Asn Lys Glu Ala Pro Asn Phe Asn Ile Lys Ile Val
395                 400                 405                 410

gcc acc gat ggc tct acc gtc aat ggt gct tgc tct tac gaa aat ggt    1599
Ala Thr Asp Gly Ser Thr Val Asn Gly Ala Cys Ser Tyr Glu Asn Gly
                415                 420                 425

gtc tac tct ggc tct ggc tct gac ggt tgt act gtt tca gtt act tct    1647
Val Tyr Ser Gly Ser Gly Ser Asp Gly Cys Thr Val Ser Val Thr Ser
            430                 435                 440

ggt tct gct aac ttt gtc ttc tac taggcctttt ttccttgaat attgcaaata   1701
Gly Ser Ala Asn Phe Val Phe Tyr
            445                 450

agcttttgct agtacttttt ttactccgtt cattttatgg tttatttttc aattagttcg  1761
tttttccaca atacaaaaaa acacagtcct ttgtactatc ccttttattt cattattttt  1821
tcttttttaa gataccacta gatattatca tatatagcat attatataac ataaaaagtc  1881
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Lys Lys Lys Lys Val Arg Pro His Asn Phe Gln Cys Ile His Ser Leu
            35                  40                  45
Asn Phe Val Tyr Phe Leu Phe Ile His Ser Phe Leu Phe Glu Tyr Asn
            50                  55                  60
Gln Leu Leu Val Leu Pro Leu Asn Lys Asn Leu Pro Ser Leu Asn Phe
65                  70                  75                  80
Ser Arg Asn Ser Ser Met Lys Leu Ser Ala Leu Leu Ala Leu Ser Ala
                85                  90                  95
Ser Thr Ala Val Leu Ala Ala Pro Ala Val His His Ser Asp Asn His
            100                 105                 110
His His Asn Asp Lys Arg Ala Val Val Thr Val Thr Gln Tyr Val Asn
            115                 120                 125
Ala Asp Gly Ala Val Val Ile Pro Ala Ala Thr Thr Ala Thr Ser Ala
            130                 135                 140
Ala Ala Asp Gly Lys Val Glu Ser Val Ala Ala Ala Thr Thr Thr Leu
145                 150                 155                 160
Ser Ser Thr Ala Ala Ala Ala Thr Thr Ser Ala Ala Ala Ser Ser Ser
                165                 170                 175
Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Val Gly Ser Gly
            180                 185                 190
Asp Phe Glu Asp Gly Thr Ile Ser Cys Ser Asp Phe Pro Ser Gly Gln
            195                 200                 205
Gly Ala Val Ser Leu Asp Trp Leu Gly Leu Gly Gly Trp Ala Ser Ile
            210                 215                 220
Met Asp Met Asn Gly Asn Thr Ala Thr Ser Cys Gln Asp Gly Tyr Tyr
225                 230                 235                 240
Cys Ser Tyr Ala Cys Ser Pro Gly Tyr Ala Lys Thr Gln Trp Pro Ser
                245                 250                 255
Glu Gln Pro Ser Asp Gly Arg Ser Val Gly Gly Leu Tyr Cys Lys Asn
            260                 265                 270
Gly Lys Leu Tyr Arg Ser Asn Thr Asp Thr Asn Ser Leu Cys Val Glu
            275                 280                 285
Gly Gln Gly Ser Ala Gln Ala Val Asn Lys Val Ser Gly Ser Ile Ala
            290                 295                 300
Ile Cys Gly Thr Asp Tyr Pro Gly Ser Glu Asn Met Val Val Pro Thr
305                 310                 315                 320
Val Val Gly Ala Gly Ser Ser Gln Pro Ile Asn Val Ile Lys Glu Asp
                325                 330                 335
Ser Tyr Tyr Gln Trp Gln Gly Lys Lys Thr Ser Ala Gln Tyr Tyr Val
            340                 345                 350
Asn Asn Ala Gly Val Ser Val Glu Asp Gly Cys Ile Trp Gly Thr Glu
            355                 360                 365
Gly Ser Gly Val Gly Asn Trp Ala Pro Val Val Leu Gly Ala Gly Tyr
            370                 375                 380
Thr Asp Gly Ile Thr Tyr Leu Ser Ile Ile Pro Asn Pro Asn Asn Lys
385                 390                 395                 400
Glu Ala Pro Asn Phe Asn Ile Lys Ile Val Ala Thr Asp Gly Ser Thr
                405                 410                 415
Val Asn Gly Ala Cys Ser Tyr Glu Asn Gly Val Tyr Ser Gly Ser Gly
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aaccatttcc atctgccgac tcagcatcga ttttaactac gtctacatca aataactcct 660
ta atg tct tac aat cat cag cct caa cta tct att aac tcc gtc caa 707
   Met Ser Tyr Asn His Gln Pro Gln Leu Ser Ile Asn Ser Val Gln
   1   5   10   15

tca ctc ttg gag ccc gtg acc cct ccg cct ttg ggc cag atg aat aac 755
Ser Leu Leu Glu Pro Val Thr Pro Pro Pro Leu Gly Gln Met Asn Asn
            20   25   30

aaa aga aac cat caa aag gct cat tcg ctt gat ctc tct ggt ttt aat 803
Lys Arg Asn His Gln Lys Ala His Ser Leu Asp Leu Ser Gly Phe Asn
            35   40   45

cag ttc ata tca tcg aca caa tct ccc ttg gct ttg atg aat aat aca 851
Gln Phe Ile Ser Ser Thr Gln Ser Pro Leu Ala Leu Met Asn Asn Thr
        50   55   60

tca aca tcg aat tct gct aac tct ttt tcc ccg aat cct aat gct gct 899
Ser Thr Ser Asn Ser Ala Asn Ser Phe Ser Pro Asn Pro Asn Ala Ala
        65   70   75

agc aac tcc act ggg ctt tca gcc tca atg gca aat cct cca gcc att 947
Ser Asn Ser Thr Gly Leu Ser Ala Ser Met Ala Asn Pro Pro Ala Ile
80   85   90   95

cta cca tta atc aat gag ttt gat ctg gaa atg gat ggt ccc agg aga 995
Leu Pro Leu Ile Asn Glu Phe Asp Leu Glu Met Asp Gly Pro Arg Arg
                    100   105   110

aaa tca agc cac gat ttc acg gtt gtt gct cct tcg aac tct ggt gtc 1043
Lys Ser Ser His Asp Phe Thr Val Val Ala Pro Ser Asn Ser Gly Val
                115   120   125

aat acc tcc agt tta att atg gaa aca cca tcc tct tca gtg act cct 1091

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Asn Thr Ser Ser Leu Ile Met Glu Thr Pro Ser Ser Ser        140
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gct gca tct ctc aga aat ttt agc aat agt aat aat gct gct tcc aaa    1139
Ala Ala Ser Leu Arg Asn Phe Ser Asn Ser Asn Asn Ala Ala Ser Lys
        145                 150                 155

tgt gga gtg gat aat tcg tca ttt ggt ttg agt agc tca acg tct tca    1187
Cys Gly Val Asp Asn Ser Ser Phe Gly Leu Ser Ser Ser Thr Ser Ser
160                 165                 170                 175

tct atg gtc gaa atc agc gca cta ccc ctt aga gat ctg gat tat atc    1235
Ser Met Val Glu Ile Ser Ala Leu Pro Leu Arg Asp Leu Asp Tyr Ile
                180                 185                 190

aaa ctt gcc act gac cag ttt ggc tgc cgt ttt ctt caa aaa aaa tta    1283
Lys Leu Ala Thr Asp Gln Phe Gly Cys Arg Phe Leu Gln Lys Lys Leu
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gaa acc ccc agt gaa tcc aat atg gtg aga gac ttg atg tat gaa caa    1331
Glu Thr Pro Ser Glu Ser Asn Met Val Arg Asp Leu Met Tyr Glu Gln
        210                 215                 220

att aag cca ttt ttc ttg gac ctt att ttg gat ccg ttc ggt aac tat    1379
Ile Lys Pro Phe Phe Leu Asp Leu Ile Leu Asp Pro Phe Gly Asn Tyr
        225                 230                 235

ttg gtt caa aaa cta tgc gat tat tta act gcc gag caa aag aca tta    1427
Leu Val Gln Lys Leu Cys Asp Tyr Leu Thr Ala Glu Gln Lys Thr Leu
240                 245                 250                 255

tta ata caa aca ata tat cca aat gtt ttc caa ata tca atc aat cag    1475
Leu Ile Gln Thr Ile Tyr Pro Asn Val Phe Gln Ile Ser Ile Asn Gln
                260                 265                 270

tac gga act cgt tcc tta cag aaa att ata gac act gtc gat aac gaa    1523
Tyr Gly Thr Arg Ser Leu Gln Lys Ile Ile Asp Thr Val Asp Asn Glu
                275                 280                 285

gtt caa atc gat ctc att att aag gga ttt tcc caa gaa ttt act tcg    1571
Val Gln Ile Asp Leu Ile Ile Lys Gly Phe Ser Gln Glu Phe Thr Ser
        290                 295                 300

att gag caa gtg gtt act ttg ata aac gat ctt aat ggt aac cat gtg    1619
Ile Glu Gln Val Val Thr Leu Ile Asn Asp Leu Asn Gly Asn His Val
        305                 310                 315

att caa aag tgt att ttc aaa ttc tcg cca tca aaa ttt ggt ttc atc    1667
Ile Gln Lys Cys Ile Phe Lys Phe Ser Pro Ser Lys Phe Gly Phe Ile
320                 325                 330                 335

ata gat gct att gta gaa caa aat aat atc att acc att tct acc cat    1715
Ile Asp Ala Ile Val Glu Gln Asn Asn Ile Ile Thr Ile Ser Thr His
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aaa cat ggt tgt tgc gta cta caa aaa tta cta agc gtt tgt act cta    1763
Lys His Gly Cys Cys Val Leu Gln Lys Leu Leu Ser Val Cys Thr Leu
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caa caa att ttc aaa att tct gtg aaa att gtg cag ttc ctt cct gga    1811
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tta atc aac gat cag ttc ggt aat tat atc atc caa ttt ctg tta gat    1859
Leu Ile Asn Asp Gln Phe Gly Asn Tyr Ile Ile Gln Phe Leu Leu Asp
        385             390                 395

atc aaa gaa ttg gac ttt tac tta ttg gct gag tta ttt aac cgt tta    1907
Ile Lys Glu Leu Asp Phe Tyr Leu Leu Ala Glu Leu Phe Asn Arg Leu
400             405                 410                 415

tcc aat gaa tta tgt caa cta tct tgt ttg aag ttc tcc tca aat gtt    1955
Ser Asn Glu Leu Cys Gln Leu Ser Cys Leu Lys Phe Ser Ser Asn Val
                420                 425                 430

gtg gaa aaa ttc att aaa aaa tta ttt aga atc att act gga ttt att    2003
Val Glu Lys Phe Ile Lys Lys Leu Phe Arg Ile Ile Thr Gly Phe Ile
            435                 440                 445

gtt aat aac aat ggg ggt gcc tcc caa agg act gca gtt gct tct gat    2051
Val Asn Asn Asn Gly Gly Ala Ser Gln Arg Thr Ala Val Ala Ser Asp
        450                 455                 460

gac gtg att aat gct tct atg aac att ctt ttg act acc att gat ata    2099
Asp Val Ile Asn Ala Ser Met Asn Ile Leu Leu Thr Thr Ile Asp Ile
465                 470                 475

ttc aca gtc aat tta aat gtg cta atc agg gat aat ttt ggt aat tat    2147
Phe Thr Val Asn Leu Asn Val Leu Ile Arg Asp Asn Phe Gly Asn Tyr
480                 485                 490                 495

gcg tta caa acg cta tta gac gtt aag aat tat tct cct ctg ctt gct    2195
Ala Leu Gln Thr Leu Leu Asp Val Lys Asn Tyr Ser Pro Leu Leu Ala
                500                 505                 510

tac aac aaa aat agt aac gca att ggg caa aac agc tct agt aca ttg    2243
Tyr Asn Lys Asn Ser Asn Ala Ile Gly Gln Asn Ser Ser Ser Thr Leu
            515                 520                 525

aat tac ggt aac ttt tgt aac gat ttt tca ttg aaa att ggt aac ttg    2291
Asn Tyr Gly Asn Phe Cys Asn Asp Phe Ser Leu Lys Ile Gly Asn Leu
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att gtc ctt aca aaa gaa tta ctt cca agt att aaa act aca tcc tat    2339
Ile Val Leu Thr Lys Glu Leu Leu Pro Ser Ile Lys Thr Thr Ser Tyr
545                 550                 555

gca aag aaa att aag ttg aaa gtt aaa gct tat gca gaa gcc aca ggt    2387
Ala Lys Lys Ile Lys Leu Lys Val Lys Ala Tyr Ala Glu Ala Thr Gly
560                 565                 570                 575

ata cca ttc act gac ata tct cct caa gtc act gca atg agt cat aac    2435
Ile Pro Phe Thr Asp Ile Ser Pro Gln Val Thr Ala Met Ser His Asn
                580                 585                 590

aat ctt caa acg att aac aac gaa aat aag aac ccc cat aac aaa aat    2483
Asn Leu Gln Thr Ile Asn Asn Glu Asn Lys Asn Pro His Asn Lys Asn
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Ser His Asn His Asn His Asn His Asn His Asn His Ala His Asn Asn
        610         615                 620

aat aac aat aat aat caa aag agt cat acc cgt cat ttt tct tta cca    2579
Asn Asn Asn Asn Asn Gln Lys Ser His Thr Arg His Phe Ser Leu Pro
    625             630                 635

gct aat gct tac cat aga aga agt aac agc tct gta acc aat aat ttc    2627
Ala Asn Ala Tyr His Arg Arg Ser Asn Ser Ser Val Thr Asn Asn Phe
640             645                 650                 655

tca aac caa tat gca caa gat cag aaa att cac tct ccg caa caa att    2675
Ser Asn Gln Tyr Ala Gln Asp Gln Lys Ile His Ser Pro Gln Gln Ile
            660                 665                 670

atg aac ttc aac caa aac gca tat ccc tcg atg gga gca cct tct ttc    2723
Met Asn Phe Asn Gln Asn Ala Tyr Pro Ser Met Gly Ala Pro Ser Phe
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aat tct caa act aac cca cca ttg gta agc cat aac tcg tta caa aac    2771
Asn Ser Gln Thr Asn Pro Pro Leu Val Ser His Asn Ser Leu Gln Asn
            690                 695                 700

ttc gac aac cgc cag ttt gca aat tta atg gca cat cct aat tct gct    2819
Phe Asp Asn Arg Gln Phe Ala Asn Leu Met Ala His Pro Asn Ser Ala
        705                 710                 715

gca cca atc cat tcg ttc tca tca tct aac att acc aat gtg aat cct    2867
Ala Pro Ile His Ser Phe Ser Ser Ser Asn Ile Thr Asn Val Asn Pro
·720                 725                 730                 735

aat gtt tca agg gga ttt aag cag cct gga ttt atg atg aat gaa acc·   2915
Asn Val Ser Arg Gly Phe Lys Gln Pro Gly Phe Met Met Asn Glu Thr
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Asp Lys Ile Asn Ala Asn His Phe Ser Pro Tyr Ser Asn Ala Asn Ser
            755                 760                 765

caa aac ttc aat gaa tct ttt gtg cct cgt atg caa tat caa acg gaa    3011
Gln Asn Phe Asn Glu Ser Phe Val Pro Arg Met Gln Tyr Gln Thr Glu
            770                 775                 780

ggt gca aac tgg gat tca agt ttg tca atg aag tcg cag cat att ggt    3059
Gly Ala Asn Trp Asp Ser Ser Leu Ser Met Lys Ser Gln His Ile Gly
785                 790                 795

caa ggc cca tat aat caa gtt aat atg agc cgc aac gct agt att tcc    3107
Gln Gly Pro Tyr Asn Gln Val Asn Met Ser Arg Asn Ala Ser Ile Ser
800                 805                 810                 815

aat atg cct gcc atg aat acc gct aga aca tct gat gaa ctt caa ttc    3155
Asn Met Pro Ala Met Asn Thr Ala Arg Thr Ser Asp Glu Leu Gln Phe
                820                 825                 830

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Thr Leu Pro
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        35                  40                  45
Phe Ile Ser Ser Thr Gln Ser Pro Leu Ala Leu Met Asn Asn Thr Ser
    50                  55                  60
Thr Ser Asn Ser Ala Asn Ser Phe Ser Pro Asn Pro Asn Ala Ala Ser
65                  70                  75                  80
Asn Ser Thr Gly Leu Ser Ala Ser Met Ala Asn Pro Pro Ala Ile Leu
                85                  90                  95
Pro Leu Ile Asn Glu Phe Asp Leu Glu Met Asp Gly Pro Arg Arg Lys
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Ser Ser His Asp Phe Thr Val Val Ala Pro Ser Asn Ser Gly Val Asn
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Thr Ser Ser Leu Ile Met Glu Thr Pro Ser Ser Ser Val Thr Pro Ala
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Ala Ser Leu Arg Asn Phe Ser Asn Ser Asn Asn Ala Ala Ser Lys Cys
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Gly Val Asp Asn Ser Ser Phe Gly Leu Ser Ser Ser Thr Ser Ser Ser
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Met Val Glu Ile Ser Ala Leu Pro Leu Arg Asp Leu Asp Tyr Ile Lys
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Leu Ala Thr Asp Gln Phe Gly Cys Arg Phe Leu Gln Lys Lys Leu Glu
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Thr Pro Ser Glu Ser Asn Met Val Arg Asp Leu Met Tyr Glu Gln Ile
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Lys Pro Phe Phe Leu Asp Leu Ile Leu Asp Pro Phe Gly Asn Tyr Leu
225                 230                 235                 240
Val Gln Lys Leu Cys Asp Tyr Leu Thr Ala Glu Gln Lys Thr Leu Leu
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Ile Gln Thr Ile Tyr Pro Asn Val Phe Gln Ile Ser Ile Asn Gln Tyr
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Gly Thr Arg Ser Leu Gln Lys Ile Ile Asp Thr Val Asp Asn Glu Val
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Gln Ile Asp Leu Ile Ile Lys Gly Phe Ser Gln Glu Phe Thr Ser Ile
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Glu Gln Val Val Thr Leu Ile Asn Asp Leu Asn Gly Asn His Val Ile
305                 310                 315                 320
Gln Lys Cys Ile Phe Lys Phe Ser Pro Ser Lys Phe Gly Phe Ile Ile
                325                 330                 335
Asp Ala Ile Val Glu Gln Asn Asn Ile Ile Thr Ile Ser Thr His Lys
            340                 345                 350
His Gly Cys Cys Val Leu Gln Lys Leu Leu Ser Val Cys Thr Leu Gln
        355                 360                 365
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Gln Ile Phe Lys Ile Ser Val Lys Ile Val Gln Phe Leu Pro Gly Leu
370   375   380

Ile Asn Asp Gln Phe Gly Asn Tyr Ile Ile Gln Phe Leu Leu Asp Ile
385   390   395   400

Lys Glu Leu Asp Phe Tyr Leu Leu Ala Glu Leu Phe Asn Arg Leu Ser
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Asn Glu Leu Cys Gln Leu Ser Cys Leu Lys Phe Ser Ser Asn Val Val
            420   425   430

Glu Lys Phe Ile Lys Lys Leu Phe Arg Ile Ile Thr Gly Phe Ile Val
        435   440   445

Asn Asn Asn Gly Gly Ala Ser Gln Arg Thr Ala Val Ala Ser Asp Asp
    450   455   460

Val Ile Asn Ala Ser Met Asn Ile Leu Leu Thr Thr Ile Asp Ile Phe
465   470   475   480

Thr Val Asn Leu Asn Val Leu Ile Arg Asp Asn Phe Gly Asn Tyr Ala
                485   490   495

Leu Gln Thr Leu Leu Asp Val Lys Asn Tyr Ser Pro Leu Leu Ala Tyr
            500   505   510

Asn Lys Asn Ser Asn Ala Ile Gly Gln Asn Ser Ser Ser Thr Leu Asn
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Tyr Gly Asn Phe Cys Asn Asp Phe Ser Leu Lys Ile Gly Asn Leu Ile
    530   535   540

Val Leu Thr Lys Glu Leu Leu Pro Ser Ile Lys Thr Thr Ser Tyr Ala
545   550   555   560

Lys Lys Ile Lys Leu Lys Val Lys Ala Tyr Ala Glu Ala Thr Gly Ile
                565   570   575

Pro Phe Thr Asp Ile Ser Pro Gln Val Thr Ala Met Ser His Asn Asn
            580   585   590

Leu Gln Thr Ile Asn Asn Glu Asn Lys Asn Pro His Asn Lys Asn Ser
    595   600   605

His Asn His Asn His Asn His Asn His Asn His Ala His Asn Asn Asn
    610   615   620

Asn Asn Asn Asn Gln Lys Ser His Thr Arg His Phe Ser Leu Pro Ala
625   630   635   640

Asn Ala Tyr His Arg Arg Ser Asn Ser Ser Val Thr Asn Asn Phe Ser
                645   650   655

Asn Gln Tyr Ala Gln Asp Gln Lys Ile His Ser Pro Gln Gln Ile Met
            660   665   670

Asn Phe Asn Gln Asn Ala Tyr Pro Ser Met Gly Ala Pro Ser Phe Asn
        675   680   685

Ser Gln Thr Asn Pro Pro Leu Val Ser His Asn Ser Leu Gln Asn Phe
    690   695   700

Asp Asn Arg Gln Phe Ala Asn Leu Met Ala His Pro Asn Ser Ala Ala
705   710   715   720

Pro Ile His Ser Phe Ser Ser Ser Asn Ile Thr Asn Val Asn Pro Asn
                725   730   735

Val Ser Arg Gly Phe Lys Gln Pro Gly Phe Met Met Asn Glu Thr Asp
            740   745   750

Lys Ile Asn Ala Asn His Phe Ser Pro Tyr Ser Asn Ala Asn Ser Gln
        755   760   765

Asn Phe Asn Glu Ser Phe Val Pro Arg Met Gln Tyr Gln Thr Glu Gly
    770   775   780

Ala Asn Trp Asp Ser Ser Leu Ser Met Lys Ser Gln His Ile Gly Gln
785   790   795   800

Gly Pro Tyr Asn Gln Val Asn Met Ser Arg Asn Ala Ser Ile Ser Asn
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Met Pro Ala Met Asn Thr Ala Arg Thr Ser Asp Glu Leu Gln Phe Thr
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Leu Pro

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ctttgtgact gcaaatttta atttgtgacg cctttctta  ttactcatgt atttgtcact   180
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cttccgtata ttacattgta cattatttt  attgtatttt agtttccaac gttaggattt   480
gagccgtcat taatattatt cgttttgta  cactattcca gacgatttat ttttagtaca   540
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ctttaggttc ttttaagagt ctctgttcat tttccgttct tactgtttct ttgtcctcga   660
tatctttaa  gaaagagaga actaagcgct gtaacatttt taagtggacc tacgtt atg   719
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tct aca aaa ggt ttg aaa gaa gaa atc gat gat gta cca tca gta gac    767
Ser Thr Lys Gly Leu Lys Glu Glu Ile Asp Asp Val Pro Ser Val Asp
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cct gtc gtt tca gaa aca gtc aat tct gct tta gag cag ttg caa cta    815
Pro Val Val Ser Glu Thr Val Asn Ser Ala Leu Glu Gln Leu Gln Leu
         20              25              30

gat gat cca gag gaa aac gcc acc tct aat gca ttt gcg aat aaa gtt    863
Asp Asp Pro Glu Glu Asn Ala Thr Ser Asn Ala Phe Ala Asn Lys Val
      35              40              45

tct caa gat tct caa ttc gct aat ggc cct ccg tcg caa atg ttt cca    911
Ser Gln Asp Ser Gln Phe Ala Asn Gly Pro Pro Ser Gln Met Phe Pro
50              55              60              65

cat cca caa atg atg ggt gga atg ggc ttc atg ccc tac tct caa atg    959
His Pro Gln Met Met Gly Gly Met Gly Phe Met Pro Tyr Ser Gln Met
              70              75              80

atg cag gtt cct cat aat cct tgt cca ttt ttt ccg ccc cct gat ttt   1007
Met Gln Val Pro His Asn Pro Cys Pro Phe Phe Pro Pro Pro Asp Phe
              85              90              95

aat gat cca aca gca cca ttg agt agc tcg ccc ttg aat gca ggc ggt   1055
Asn Asp Pro Thr Ala Pro Leu Ser Ser Ser Pro Leu Asn Ala Gly Gly
         100             105             110

cca cca atg tta ttc aag aat gac tca ctt cca ttt caa atg ctg tct   1103
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                                          Pro Phe Gln Met Leu Ser
Pro Pro Met Leu Phe Lys Asn Asp Ser Leu Pro     125
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tcg ggt gct gcg gta gca act caa ggt gga caa aat cta aac cca ttg   1151
Ser Gly Ala Ala Val Ala Thr Gln Gly Gly Gln Asn Leu Asn Pro Leu
130                 135                 140                 145

ata aat gac aat tca atg aag gta ttg cca atc gca tcg gct gat ccg   1199
Ile Asn Asp Asn Ser Met Lys Val Leu Pro Ile Ala Ser Ala Asp Pro
                150                 155                 160

tta tgg act cat tca aac gta cca gga tca gca tct gta gcc att gaa   1247
Leu Trp Thr His Ser Asn Val Pro Gly Ser Ala Ser Val Ala Ile Glu
            165                 170                 175

gaa acc acc gct act cta caa gaa agc cta cca tct aag ggc agg gag   1295
Glu Thr Thr Ala Thr Leu Gln Glu Ser Leu Pro Ser Lys Gly Arg Glu
            180                 185                 190

tct aat aat aag gct agt tcg ttc aga aga caa act ttt cat gct tta   1343
Ser Asn Asn Lys Ala Ser Ser Phe Arg Arg Gln Thr Phe His Ala Leu
    195                 200                 205

tca cca act gac ctt atc aat gcg gcc aac aat gta acc ttg tca aag   1391
Ser Pro Thr Asp Leu Ile Asn Ala Ala Asn Asn Val Thr Leu Ser Lys
210                 215                 220                 225

gac ttc caa tct gac atg cag aat ttt tct aag gct aag aaa ccg tct   1439
Asp Phe Gln Ser Asp Met Gln Asn Phe Ser Lys Ala Lys Lys Pro Ser
                230                 235                 240

gta gga gct aac aat act gca aaa acc aga act caa tcc ata tct ttt   1487
Val Gly Ala Asn Asn Thr Ala Lys Thr Arg Thr Gln Ser Ile Ser Phe
                245                 250                 255

gat aat act ccc tcc tca acg tca ttt ata ccc cca acc aat agt gtt   1535
Asp Asn Thr Pro Ser Ser Thr Ser Phe Ile Pro Pro Thr Asn Ser Val
            260                 265                 270

tct gag aaa tta tcc gat ttc aaa ata gaa acc tcg aag gag gat ttg   1583
Ser Glu Lys Leu Ser Asp Phe Lys Ile Glu Thr Ser Lys Glu Asp Leu
    275                 280                 285

att aat aaa act gca cca gct aaa aaa gag agt cct aca act tat ggt   1631
Ile Asn Lys Thr Ala Pro Ala Lys Lys Glu Ser Pro Thr Thr Tyr Gly
290                 295                 300                 305

gca gca tat cca tat ggg gga cct tta ctt caa cca aat cct att atg   1679
Ala Ala Tyr Pro Tyr Gly Gly Pro Leu Leu Gln Pro Asn Pro Ile Met
                310                 315                 320

cca ggc cac cca cat aat ata tcc tcc cct atc tat ggt att aga tca   1727
Pro Gly His Pro His Asn Ile Ser Ser Pro Ile Tyr Gly Ile Arg Ser
            325                 330                 335

cct ttt cct aat tct tat gaa atg ggc gcg caa ttt caa cct ttc tct   1775
Pro Phe Pro Asn Ser Tyr Glu Met Gly Ala Gln Phe Gln Pro Phe Ser
            340                 345                 350
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ccg att tta aat cct acg agt cat tca cta aat gca aat tct cca att   1823
Pro Ile Leu Asn Pro Thr Ser His Ser Leu Asn Ala Asn Ser Pro Ile
        355             360                 365

cct cta acc caa tcg cca att cat ctt gca cca gtt tta aac cct agt   1871
Pro Leu Thr Gln Ser Pro Ile His Leu Ala Pro Val Leu Asn Pro Ser
370                 375                 380                 385

tca aat tct gtt gcc ttt tca gat atg aag aat gat ggt ggt aag ccc   1919
Ser Asn Ser Val Ala Phe Ser Asp Met Lys Asn Asp Gly Gly Lys Pro
                390                 395                 400

acc acc gat aac gac aag gcg ggt cca aat gtt agg atg gat tta ata   1967
Thr Thr Asp Asn Asp Lys Ala Gly Pro Asn Val Arg Met Asp Leu Ile
                405                 410                 415

aat cct aat ctt ggg cca tca atg caa cct ttc cac ata tta cct ccc   2015
Asn Pro Asn Leu Gly Pro Ser Met Gln Pro Phe His Ile Leu Pro Pro
                420                 425                 430

cag caa aac acc ccc cct cct ccc tgg ctt tat agc act cca cct ccc   2063
Gln Gln Asn Thr Pro Pro Pro Pro Trp Leu Tyr Ser Thr Pro Pro Pro
        435                 440                 445

ttc aac gca atg gtt ccg cct cat ttg ttg gct caa aat cat atg ccg   2111
Phe Asn Ala Met Val Pro Pro His Leu Leu Ala Gln Asn His Met Pro
450                 455                 460                 465

tta atg aat agc gcc aat aat aaa cat cat ggt cgt aat aac aat agc   2159
Leu Met Asn Ser Ala Asn Asn Lys His His Gly Arg Asn Asn Asn Ser
                470                 475                 480

atg tca agt cat aat gac aat gac aac att ggt aat tct aat tac aac   2207
Met Ser Ser His Asn Asp Asn Asp Asn Ile Gly Asn Ser Asn Tyr Asn
                485                 490                 495

aat aaa gac aca ggt cgt tct aac gtt ggt aaa atg aaa aat atg aaa   2255
Asn Lys Asp Thr Gly Arg Ser Asn Val Gly Lys Met Lys Asn Met Lys
                500                 505                 510

aac agt tat cat ggc tac tat aat aac aat aat aat aat aat aat aat   2303
Asn Ser Tyr His Gly Tyr Tyr Asn Asn Asn Asn Asn Asn Asn Asn Asn
        515                 520                 525

aac aat aat aat aat aac agt aat gct acc aac agc aac agc gcg gaa   2351
Asn Asn Asn Asn Asn Asn Ser Asn Ala Thr Asn Ser Asn Ser Ala Glu
530                 535                 540                 545

aaa caa cgt aaa att gag gag tcg tcg aga ttt gcg gac gca gtt tta   2399
Lys Gln Arg Lys Ile Glu Glu Ser Ser Arg Phe Ala Asp Ala Val Leu
                550                 555                 560

gac caa tat atc gga agt att cac tca ttg tgt aaa gac caa cat ggt   2447
Asp Gln Tyr Ile Gly Ser Ile His Ser Leu Cys Lys Asp Gln His Gly
                565                 570                 575

tgt cgt ttt ctg caa aag cag ttg gat att ctc ggc agt aag gcg gcg   2495
Cys Arg Phe Leu Gln Lys Gln Leu Asp Ile Leu Gly Ser Lys Ala Ala
        580                 585                 590
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gac cga att ttt gaa gaa act aag gat tat acg gtt gaa ttg atg act    2543
Asp Arg Ile Phe Glu Glu Thr Lys Asp Tyr Thr Val Glu Leu Met Thr
595             600                 605

gat tca ttc ggt aat tat ttg atc cag aag cta ttg gaa gag gtt acc    2591
Asp Ser Phe Gly Asn Tyr Leu Ile Gln Lys Leu Leu Glu Glu Val Thr
610             615                 620                 625

aca gaa caa aga atc gta ctc aca aaa ata tct tcc cct cat ttt gtc    2639
Thr Glu Gln Arg Ile Val Leu Thr Lys Ile Ser Ser Pro His Phe Val
            630                 635                 640

gaa att tcc tta aac cct cat ggt act agg gca tta caa aaa ctc att    2687
Glu Ile Ser Leu Asn Pro His Gly Thr Arg Ala Leu Gln Lys Leu Ile
            645                 650                 655

gaa tgc atc aaa aca gat gaa gaa gca cag att gtt gtt gat tct tta    2735
Glu Cys Ile Lys Thr Asp Glu Glu Ala Gln Ile Val Val Asp Ser Leu
            660                 665                 670

cgc cct tat act gtc cag ttg agt aag gat tta aat ggt aat cat gtt    2783
Arg Pro Tyr Thr Val Gln Leu Ser Lys Asp Leu Asn Gly Asn His Val
675                 680                 685

att caa aaa tgt ttg caa agg ttg aag cct gaa aac ttc cag ttt atc    2831
Ile Gln Lys Cys Leu Gln Arg Leu Lys Pro Glu Asn Phe Gln Phe Ile
690                 695                 700                 705

ttt gac gca atc tct gat agc tgt att gat att gct act cat aga cac    2879
Phe Asp Ala Ile Ser Asp Ser Cys Ile Asp Ile Ala Thr His Arg His
            710                 715                 720

ggg tgt tgc gtt ttg caa cgt tgt cta gat cat ggg act aca gaa caa    2927
Gly Cys Cys Val Leu Gln Arg Cys Leu Asp His Gly Thr Thr Glu Gln
            725                 730                 735

tgt gac aat ctg tgt gat aag ttg cta gcc ctt gtt gat aaa tta act    2975
Cys Asp Asn Leu Cys Asp Lys Leu Leu Ala Leu Val Asp Lys Leu Thr
            740                 745                 750

ttg gat cca ttt ggc aac tat gtg gtg caa tat ata att acc aaa gag    3023
Leu Asp Pro Phe Gly Asn Tyr Val Val Gln Tyr Ile Ile Thr Lys Glu
            755                 760                 765

gct gag aag aac aaa tat gat tat acg cat aaa att gtc cac ctg ttg    3071
Ala Glu Lys Asn Lys Tyr Asp Tyr Thr His Lys Ile Val His Leu Leu
770                 775                 780                 785

aaa cca aga gcc atc gaa ctt tct atc cat aaa ttt gga tca aat gtg    3119
Lys Pro Arg Ala Ile Glu Leu Ser Ile His Lys Phe Gly Ser Asn Val
            790                 795                 800

att gaa aaa atc ttg aag aca gct att gtt tcg gag cca atg att ctg    3167
Ile Glu Lys Ile Leu Lys Thr Ala Ile Val Ser Glu Pro Met Ile Leu
            805                 810                 815

gaa att tta aat aat ggt ggc gag acg ggt att caa tca ttg ttg aat    3215
Glu Ile Leu Asn Asn Gly Gly Glu Thr Gly Ile Gln Ser Leu Leu Asn
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gat agc tac gga aat tac gtt tta cag aca gca tta gac att tct cat   3263
Asp Ser Tyr Gly Asn Tyr Val Leu Gln Thr Ala Leu Asp Ile Ser His
    835                 840                 845

aag caa aat gac tat ctc tat aaa aga cta tca gag att gtg gcg cct   3311
Lys Gln Asn Asp Tyr Leu Tyr Lys Arg Leu Ser Glu Ile Val Ala Pro
850                 855                 860                 865

tta ctg gtg ggc ccc ata aga aat aca cct cat ggt aaa aga atc atc   3359
Leu Leu Val Gly Pro Ile Arg Asn Thr Pro His Gly Lys Arg Ile Ile
                870                 875                 880

                                                                  3410
gga atg tta cat tta gat tca tagttgatac atatatcctc agtttagctt
Gly Met Leu His Leu Asp Ser
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        35                  40                  45
Val Ser Gln Asp Ser Gln Phe Ala Asn Gly Pro Pro Ser Gln Met Phe
    50                  55                  60
Pro His Pro Gln Met Met Gly Gly Met Gly Phe Met Pro Tyr Ser Gln
65                  70                  75                  80
Met Met Gln Val Pro His Asn Pro Cys Pro Phe Phe Pro Pro Pro Asp
                85                  90                  95
Phe Asn Asp Pro Thr Ala Pro Leu Ser Ser Ser Pro Leu Asn Ala Gly
            100                 105                 110
Gly Pro Pro Met Leu Phe Lys Asn Asp Ser Leu Pro Phe Gln Met Leu
        115                 120                 125
Ser Ser Gly Ala Ala Val Ala Thr Gln Gly Gly Gln Asn Leu Asn Pro
    130                 135                 140
Leu Ile Asn Asp Asn Ser Met Lys Val Leu Pro Ile Ala Ser Ala Asp
145                 150                 155                 160
Pro Leu Trp Thr His Ser Asn Val Pro Gly Ser Ala Ser Val Ala Ile
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Glu Glu Thr Thr Ala Thr Leu Gln Glu Ser Leu Pro Ser Lys Gly Arg
            180                 185                 190
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Glu Ser Asn Asn Lys Ala Ser Ser Phe Arg Arg Gln Thr Phe His Ala
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Leu Ser Pro Thr Asp Leu Ile Asn Ala Ala Asn Asn Val Thr Leu Ser
210   215   220

Lys Asp Phe Gln Ser Asp Met Gln Asn Phe Ser Lys Ala Lys Lys Pro
225   230   235   240

Ser Val Gly Ala Asn Asn Thr Ala Lys Thr Arg Thr Gln Ser Ile Ser
                        245   250   255

Phe Asp Asn Thr Pro Ser Ser Thr Ser Phe Ile Pro Pro Thr Asn Ser
                        260   265   270

Val Ser Glu Lys Leu Ser Asp Phe Lys Ile Glu Thr Ser Lys Glu Asp
275   280   285

Leu Ile Asn Lys Thr Ala Pro Ala Lys Lys Glu Ser Pro Thr Thr Tyr
290   295   300

Gly Ala Ala Tyr Pro Tyr Gly Gly Pro Leu Leu Gln Pro Asn Pro Ile
305   310   315   320

Met Pro Gly His Pro His Asn Ile Ser Ser Pro Ile Tyr Gly Ile Arg
                        325   330   335

Ser Pro Phe Pro Asn Ser Tyr Glu Met Gly Ala Gln Phe Gln Pro Phe
                        340   345   350

Ser Pro Ile Leu Asn Pro Thr Ser His Ser Leu Asn Ala Asn Ser Pro
355   360   365

Ile Pro Leu Thr Gln Ser Pro Ile His Leu Ala Pro Val Leu Asn Pro
370   375   380

Ser Ser Asn Ser Val Ala Phe Ser Asp Met Lys Asn Asp Gly Gly Lys
385   390   395   400

Pro Thr Thr Asp Asn Asp Lys Ala Gly Pro Asn Val Arg Met Asp Leu
                        405   410   415

Ile Asn Pro Asn Leu Gly Pro Ser Met Gln Pro Phe His Ile Leu Pro
                        420   425   430

Pro Gln Gln Asn Thr Pro Pro Pro Pro Trp Leu Tyr Ser Thr Pro Pro
435   440   445

Pro Phe Asn Ala Met Val Pro Pro His Leu Leu Ala Gln Asn His Met
450   455   460

Pro Leu Met Asn Ser Ala Asn Asn Lys His His Gly Arg Asn Asn Asn
465   470   475   480

Ser Met Ser Ser His Asn Asp Asn Asp Asn Ile Gly Asn Ser Asn Tyr
                        485   490   495

Asn Asn Lys Asp Thr Gly Arg Ser Asn Val Gly Lys Met Lys Asn Met
                        500   505   510

Lys Asn Ser Tyr His Gly Tyr Tyr Asn Asn Asn Asn Asn Asn Asn Asn
515   520   525

Asn Asn Asn Asn Asn Asn Asn Ser Asn Ala Thr Asn Ser Asn Ser Ala
530   535   540

Glu Lys Gln Arg Lys Ile Glu Glu Ser Ser Arg Phe Ala Asp Ala Val
545   550   555   560

Leu Asp Gln Tyr Ile Gly Ser Ile His Ser Leu Cys Lys Asp Gln His
                        565   570   575

Gly Cys Arg Phe Leu Gln Lys Gln Leu Asp Ile Leu Gly Ser Lys Ala
                        580   585   590

Ala Asp Arg Ile Phe Glu Glu Thr Lys Asp Tyr Thr Val Glu Leu Met
595   600   605

Thr Asp Ser Phe Gly Asn Tyr Leu Ile Gln Lys Leu Leu Glu Glu Val
610   615   620

Thr Thr Glu Gln Arg Ile Val Leu Thr Lys Ile Ser Ser Pro His Phe
625   630   635   640

Val Glu Ile Ser Leu Asn Pro His Gly Thr Arg Ala Leu Gln Lys Leu
                        645   650   655

Ile Glu Cys Ile Lys Thr Asp Glu Glu Ala Gln Ile Val Val Asp Ser

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                          660                   665              670
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Leu Arg Pro Tyr Thr Val Gln Leu Ser Lys Asp Leu           685
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Val Ile Gln Lys Cys Leu Gln Arg Leu Lys Pro Glu Asn Phe Gln Phe
                690          695              700
Ile Phe Asp Ala Ile Ser Asp Ser Cys Ile Asp Ile Ala Thr His Arg
705              710              715                       720
His Gly Cys Cys Val Leu Gln Arg Cys Leu Asp His Gly Thr Thr Glu
                  725              730              735
Gln Cys Asp Asn Leu Cys Asp Lys Leu Leu Ala Leu Val Asp Lys Leu
              740              745              750
Thr Leu Asp Pro Phe Gly Asn Tyr Val Val Gln Tyr Ile Ile Thr Lys
          755              760              765
Glu Ala Glu Lys Asn Lys Tyr Asp Tyr Thr His Lys Ile Val His Leu
      770              775              780
Leu Lys Pro Arg Ala Ile Glu Leu Ser Ile His Lys Phe Gly Ser Asn
785              790              795                       800
Val Ile Glu Lys Ile Leu Lys Thr Ala Ile Val Ser Glu Pro Met Ile
                  805              810                       815
Leu Glu Ile Leu Asn Asn Gly Gly Glu Thr Gly Ile Gln Ser Leu Leu
              820              825              830
Asn Asp Ser Tyr Gly Asn Tyr Val Leu Gln Thr Ala Leu Asp Ile Ser
          835              840              845
His Lys Gln Asn Asp Tyr Leu Tyr Lys Arg Leu Ser Glu Ile Val Ala
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Ser Val Ala Cys Val Leu Lys Arg Lys Ala Val Leu Trp Gln Asp Ser
            5               10                  15

ttc agc ccc cac ctg aaa cat cac cct caa gaa cca gct aat ccc aac     155
Phe Ser Pro His Leu Lys His His Pro Gln Glu Pro Ala Asn Pro Asn
        20                  25                  30

atg cct gtt gtt ttg aca tct gga aca ggg tcg caa gcg cag cca caa     203
Met Pro Val Val Leu Thr Ser Gly Thr Gly Ser Gln Ala Gln Pro Gln
    35                  40                  45

cca gct gca aat cag gct ctt gca gct ggg act cac tcc agc cct gtc     251
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                          Pro Ala Ala Asn Gln Ala Leu Ala Ala Gly Thr His Ser Ser Pro Val
                                                                                        65
                          50              55                  60
cca gga tct ata gga gtt gca ggc cgt tcc cag gac gac gct atg gtg   299
Pro Gly Ser Ile Gly Val Ala Gly Arg Ser Gln Asp Asp Ala Met Val
                70                  75                  80

gac tac ttc ttt cag agg cag cat ggt gag cag ctt ggg gga gga gga   347
Asp Tyr Phe Phe Gln Arg Gln His Gly Glu Gln Leu Gly Gly Gly Gly
                85                  90                  95

agt gga gga ggc ggc tat aat aat agc aaa cat cga tgg cct act ggg   395
Ser Gly Gly Gly Gly Tyr Asn Asn Ser Lys His Arg Trp Pro Thr Gly
                100                 105             110

gat aac att cat gca gaa cat cag gtg cgt tcc atg gat gaa ctg aat   443
Asp Asn Ile His Ala Glu His Gln Val Arg Ser Met Asp Glu Leu Asn
        115             120                 125

cat gat ttt caa gca ctt gct ctg gag gga aga gcg atg gga gag cag   491
His Asp Phe Gln Ala Leu Ala Leu Glu Gly Arg Ala Met Gly Glu Gln
130             135                 140             145

ctc ttg cca ggt aaa aag ttt tgg gaa aca gat gaa tcc agc aaa gat   539
Leu Leu Pro Gly Lys Lys Phe Trp Glu Thr Asp Glu Ser Ser Lys Asp
                150                 155             160

gga cca aaa gga ata ttc ctg ggt gat caa tgg cga gac agt gcc tgg   587
Gly Pro Lys Gly Ile Phe Leu Gly Asp Gln Trp Arg Asp Ser Ala Trp
                165             170                 175

gga aca tca gat cat tca gtt tcc cag cca atc atg gtg cag aga aga   635
Gly Thr Ser Asp His Ser Val Ser Gln Pro Ile Met Val Gln Arg Arg
                180             185                 190

cct ggt cag agt ttc cat gtg aac agt gag gtc aat tct gta ctg tcc   683
Pro Gly Gln Ser Phe His Val Asn Ser Glu Val Asn Ser Val Leu Ser
        195                 200                 205

cca cga tcg gag agt ggg gga cta ggc gtt agc atg gtg gag tat gtg   731
Pro Arg Ser Glu Ser Gly Gly Leu Gly Val Ser Met Val Glu Tyr Val
210                 215                 220                 225

ttg agc tca tcc ccg ggc gat tcc tgt cta aga aaa gga gga ttt ggc   779
Leu Ser Ser Ser Pro Gly Asp Ser Cys Leu Arg Lys Gly Gly Phe Gly
                230                 235                 240

cca agg gat gca gac agt gat gaa aac gac aaa ggt gaa aag aag aac   827
Pro Arg Asp Ala Asp Ser Asp Glu Asn Asp Lys Gly Glu Lys Lys Asn
                245                 250                 255

aag ggt acg ttt gat gga gat aag cta gga gat ttg aag gag gag ggt   875
Lys Gly Thr Phe Asp Gly Asp Lys Leu Gly Asp Leu Lys Glu Glu Gly
                260                 265             270

gat gtg atg gac aag acc aat ggt tta cca gtg cag aat ggg att gat   923
Asp Val Met Asp Lys Thr Asn Gly Leu Pro Val Gln Asn Gly Ile Asp
        275             280                 285
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gca gac gtc aaa gat ttt agc cgt acc cct ggt aat tgc cag aac tct    971
Ala Asp Val Lys Asp Phe Ser Arg Thr Pro Gly Asn Cys Gln Asn Ser
290                     295                 300                 305

gct aat gaa gtg gat ctt ctg ggt cca aac cag aat ggt tct gag ggc   1019
Ala Asn Glu Val Asp Leu Leu Gly Pro Asn Gln Asn Gly Ser Glu Gly
            310                 315                 320

tta gcc cag ctg acc agc acc aat ggt gcc aag cct gtg gag gat ttc   1067
Leu Ala Gln Leu Thr Ser Thr Asn Gly Ala Lys Pro Val Glu Asp Phe
            325                 330                 335

tcc aac atg gag tcc cag agt gtc ccc ttg gac ccc atg gaa cat gtg   1115
Ser Asn Met Glu Ser Gln Ser Val Pro Leu Asp Pro Met Glu His Val
            340                 345                 350

ggc atg gag cct ctt cag ttt gat tat tca ggc acg cag gta cct gtg   1163
Gly Met Glu Pro Leu Gln Phe Asp Tyr Ser Gly Thr Gln Val Pro Val
            355                 360                 365

gac tca gca gca gca act gtg gga ctt ttt gac tac aat tct caa caa   1211
Asp Ser Ala Ala Ala Thr Val Gly Leu Phe Asp Tyr Asn Ser Gln Gln
370                     375                 380                 385

cag ctg ttc caa aga cct aat gcg ctt gct gtc cag cag ttg aca gct   1259
Gln Leu Phe Gln Arg Pro Asn Ala Leu Ala Val Gln Gln Leu Thr Ala
                390                 395                 400

gct cag cag cag cag tat gca ctg gca gct gct cat cag ccg cac atc   1307
Ala Gln Gln Gln Gln Tyr Ala Leu Ala Ala Ala His Gln Pro His Ile
                405                 410                 415

ggt tta gct ccc gct gcg ttt gtc ccc aat cca tac atc atc agc gct   1355
Gly Leu Ala Pro Ala Ala Phe Val Pro Asn Pro Tyr Ile Ile Ser Ala
            420                 425                 430

gct ccc cca ggg acg gac ccc tac aca gct gga ttg gct gca gca gcg   1403
Ala Pro Pro Gly Thr Asp Pro Tyr Thr Ala Gly Leu Ala Ala Ala Ala
            435                 440                 445

aca cta ggc cca gct gtg gtc cct cac cag tat tat gga gtt act ccc   1451
Thr Leu Gly Pro Ala Val Val Pro His Gln Tyr Tyr Gly Val Thr Pro
450                 455                 460                 465

tgg gga gtc tac cct gcc agt ctt ttc cag cag caa gct gcc gct gcc   1499
Trp Gly Val Tyr Pro Ala Ser Leu Phe Gln Gln Gln Ala Ala Ala Ala
                470                 475                 480

gct gca gca act aat tca gct aat caa cag acc acc cca cag gct cag   1547
Ala Ala Ala Thr Asn Ser Ala Asn Gln Gln Thr Thr Pro Gln Ala Gln
                485                 490                 495

caa gga cag cag cag gtt ctc cgt gga gga gcc agc caa cgt cct ttg   1595
Gln Gly Gln Gln Gln Val Leu Arg Gly Gly Ala Ser Gln Arg Pro Leu
            500                 505                 510

acc cca aac cag aac cag cag gga cag caa acg gat ccc ctt gtg gca   1643
Thr Pro Asn Gln Asn Gln Gln Gly Gln Gln Thr Asp Pro Leu Val Ala
            515                 520                 525
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gct gca gca gtg aat tct gcc ctt gca ttt gga caa ggt ctg gca gca    1691
Ala Ala Ala Val Asn Ser Ala Leu Ala Phe Gly Gln Gly Leu Ala Ala
530                 535                 540                 545

ggc atg cca ggt tat ccg gtg ttg gct cct gct gct tac tat gac caa    1739
Gly Met Pro Gly Tyr Pro Val Leu Ala Pro Ala Ala Tyr Tyr Asp Gln
                    550                 555                 560

act ggt gcc ctt gta gtg aat gca ggc gcg aga aat ggt ctt gga gct    1787
Thr Gly Ala Leu Val Val Asn Ala Gly Ala Arg Asn Gly Leu Gly Ala
                565                 570                 575

cct gtt cga ctt gta gct cct gcc cca gtc atc att agt tcc tca gct    1835
Pro Val Arg Leu Val Ala Pro Ala Pro Val Ile Ile Ser Ser Ser Ala
            580                 585                 590

gca caa gca gct gtt gca gca gcc gca gct tca gca aat gga gca gct    1883
Ala Gln Ala Ala Val Ala Ala Ala Ala Ala Ser Ala Asn Gly Ala Ala
        595                 600                 605

ggt ggt ctt gct gga aca aca aat gga cca ttt cgc cct tta gga aca    1931
Gly Gly Leu Ala Gly Thr Thr Asn Gly Pro Phe Arg Pro Leu Gly Thr
610                 615                 620                 625

cag cag cct cag ccc cag ccc cag cag cag ccc aat aac aac ctg gca    1979
Gln Gln Pro Gln Pro Gln Pro Gln Gln Gln Pro Asn Asn Asn Leu Ala
                    630                 635                 640

tcc agt tct ttc tac ggc aac aac tct ctg aac agc aat tca cag agc    2027
Ser Ser Ser Phe Tyr Gly Asn Asn Ser Leu Asn Ser Asn Ser Gln Ser
                645                 650                 655

agc tcc ctc ttc tcc cag ggc tct gcc cag cct gcc aac aca tcc ttg    2075
Ser Ser Leu Phe Ser Gln Gly Ser Ala Gln Pro Ala Asn Thr Ser Leu
            660                 665                 670

gga ttc gga agt agc agt tct ctc ggc gcc acc ctg gga tcc gcc ctt    2123
Gly Phe Gly Ser Ser Ser Ser Leu Gly Ala Thr Leu Gly Ser Ala Leu
675                 680                 685

gga ggg ttt gga aca gca gtt gca aac tcc aac act ggc agt ggc tcc    2171
Gly Gly Phe Gly Thr Ala Val Ala Asn Ser Asn Thr Gly Ser Gly Ser
690                 695                 700                 705

cgc cgt gac tcc ctg act ggc agc agt gac ctt tat aag agg aca tcg    2219
Arg Arg Asp Ser Leu Thr Gly Ser Ser Asp Leu Tyr Lys Arg Thr Ser
                710                 715                 720

agc agc ttg acc ccc att gga cac agt ttt tat aac ggc ctt agc ttt    2267
Ser Ser Leu Thr Pro Ile Gly His Ser Phe Tyr Asn Gly Leu Ser Phe
                725                 730                 735

tcc tcc tct cct gga ccc gtg ggc atg cct ctc cct agt cag gga cca    2315
Ser Ser Ser Pro Gly Pro Val Gly Met Pro Leu Pro Ser Gln Gly Pro
                740                 745                 750

gga cat tca cag aca cca cct cct tcc ctc tct tca cat gga tcc tct    2363
Gly His Ser Gln Thr Pro Pro Pro Ser Leu Ser Ser His Gly Ser Ser
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                    755                      760                              765
                                                                                            2411
        tca agc tta aac ctg gga gga ctc acg aat ggc agt gga aga tac atc
        Ser Ser Leu Asn Leu Gly Gly Leu Thr Asn Gly Ser Gly Arg Tyr Ile
                                        775              780              785
        770
                                                                                            2459
        tct gct gct cca ggc gct gaa gcc aag tac cgc agt gca agc agc gcc
        Ser Ala Ala Pro Gly Ala Glu Ala Lys Tyr Arg Ser Ala Ser Ser Ala
                        790                  795              800

                                                                                            2507
        tcc agc ctc ttc agc ccg agc agc act ctt ttc tct tcc tct cgt ttg
        Ser Ser Leu Phe Ser Pro Ser Ser Thr Leu Phe Ser Ser Ser Arg Leu
                            805                  810              815

                                                                                            2555
        cga tat gga atg tct gat gtc atg cct tct ggc agg agc agg ctt ttg
        Arg Tyr Gly Met Ser Asp Val Met Pro Ser Gly Arg Ser Arg Leu Leu
                        820                  825              830

                                                                                            2603
        gaa gat ttt cga aac aac cgg tac ccc aat tta caa ctg cgg gag att
        Glu Asp Phe Arg Asn Asn Arg Tyr Pro Asn Leu Gln Leu Arg Glu Ile
                835                  840                  845

                                                                                            2651
        gct gga cat ata atg gaa ttt tcc caa gac cag cat ggg tcc aga ttc
        Ala Gly His Ile Met Glu Phe Ser Gln Asp Gln His Gly Ser Arg Phe
        850                  855                  860              865

                                                                                            2699
        att cag ctg aaa ctg gag cgt gcc aca cca gct gag cgc cag ctt gtc
        Ile Gln Leu Lys Leu Glu Arg Ala Thr Pro Ala Glu Arg Gln Leu Val
                            870                  875              880

                                                                                            2747
        ttc aat gaa atc ctc cag gct gcc tac caa ctc atg gtg gat gtg ttt
        Phe Asn Glu Ile Leu Gln Ala Ala Tyr Gln Leu Met Val Asp Val Phe
                            885                  890                  895

                                                                                            2795
        ggt aat tac gtc att cag aag ttc ttt gaa ttt ggc agt ctt gaa cag
        Gly Asn Tyr Val Ile Gln Lys Phe Phe Glu Phe Gly Ser Leu Glu Gln
                        900                  905                  910

                                                                                            2843
        aag ctg gct ttg gca gaa cgg att cga ggc cac gtc ctg tca ttg gca
        Lys Leu Ala Leu Ala Glu Arg Ile Arg Gly His Val Leu Ser Leu Ala
                        915                  920                  925

                                                                                            2891
        cta cag atg tat ggc tgc cgt gtt atc cag aaa gct ctt gag ttt att
        Leu Gln Met Tyr Gly Cys Arg Val Ile Gln Lys Ala Leu Glu Phe Ile
        930                  935                  940              945

                                                                                            2939
        cct tca gac cag cag aat gag atg gtt cgg gaa cta gat ggc cat gtc
        Pro Ser Asp Gln Gln Asn Glu Met Val Arg Glu Leu Asp Gly His Val
                        950                  955              960

                                                                                            2987
        ttg aag tgt gtg aaa gat cag aat ggc aat cac gtg gtt cag aaa tgc
        Leu Lys Cys Val Lys Asp Gln Asn Gly Asn His Val Val Gln Lys Cys
                        965                  970                  975

                                                                                            3035
        att gaa tgt gta cag ccc cag tct ttg caa ttt atc atc gat gcg ttt
        Ile Glu Cys Val Gln Pro Gln Ser Leu Gln Phe Ile Ile Asp Ala Phe
                        980                  985                  990

                                                                                            3083
        aag gga cag gta ttt gcc tta tcc aca cat cct tat ggc tgc cga gtg
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                                                    Lys Gly Gln Val Phe Ala Leu Ser Thr His Pro Tyr Gly Cys Arg Val
                                                        995               1000                    1005

att cag aga atc ctg gag cac tgt ctc cct gac cag aca ctc cct att   3131
Ile Gln Arg Ile Leu Glu His Cys Leu Pro Asp Gln Thr Leu Pro Ile
1010              1015                   1020                  1025

tta gag gag ctt cac cag cac aca gag cag ctt gta cag gat caa tat   3179
Leu Glu Glu Leu His Gln His Thr Glu Gln Leu Val Gln Asp Gln Tyr
                 1030                   1035              1040

gga aat tat gta atc caa cat gta ctg gag cac ggt cgt cct gag gat   3227
Gly Asn Tyr Val Ile Gln His Val Leu Glu His Gly Arg Pro Glu Asp
             1045                   1050              1055

aaa agc aaa att gta gca gaa atc cga ggc aat gta ctt gta ttg agt   3275
Lys Ser Lys Ile Val Ala Glu Ile Arg Gly Asn Val Leu Val Leu Ser
             1060                   1065              1070

cag cac aaa ttt gca agc aat gtt gtg gag aag tgt gtt act cac gcc   3323
Gln His Lys Phe Ala Ser Asn Val Val Glu Lys Cys Val Thr His Ala
         1075              1080                   1085

tca cgt acg gag cgc gct gtg ctc atc gat gag gtg tgc acc atg aac   3371
Ser Arg Thr Glu Arg Ala Val Leu Ile Asp Glu Val Cys Thr Met Asn
1090              1095                   1100                  1105

gac ggt ccc cac agt gcc tta tac acc atg atg aag gac cag tat gcc   3419
Asp Gly Pro His Ser Ala Leu Tyr Thr Met Met Lys Asp Gln Tyr Ala
                 1110                   1115                  1120

aac tac gtg gtc cag aag atg att gac gtg gcg gag cca ggc cag cgg   3467
Asn Tyr Val Val Gln Lys Met Ile Asp Val Ala Glu Pro Gly Gln Arg
             1125                   1130              1135

aag atc gtc atg cat aag atc cgg ccc cac atc gca act ctt cgt aag   3515
Lys Ile Val Met His Lys Ile Arg Pro His Ile Ala Thr Leu Arg Lys
         1140                   1145                  1150

tac acc tat ggc aag cac att ctg gcc aag ctg gag aag tac tac atg   3563
Tyr Thr Tyr Gly Lys His Ile Leu Ala Lys Leu Glu Lys Tyr Tyr Met
    1155                   1160                  1165

aag aac ggt gtt gac tta ggg ccc atc tgt ggc ccc cct aat ggt atc   3611
Lys Asn Gly Val Asp Leu Gly Pro Ile Cys Gly Pro Pro Asn Gly Ile
1170                   1175                  1180              1185

atc tgaggcagtg tcacccgctg ttccctcatt cccgctgacc tcactggccc    3664
Ile


actggcaaat ccaaccagca accagaaatg ttctagtgta gagtctgaga cgggcaagtg 3724
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<210> 8
<211> 1186
<212> PRT
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<400> 8

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Ser Phe Ser Pro His Leu Lys His His Pro Gln Glu Pro Ala Asn Pro
                20                  25                  30
Asn Met Pro Val Val Leu Thr Ser Gly Thr Gly Ser Gln Ala Gln Pro
            35                  40                  45
Gln Pro Ala Ala Asn Gln Ala Leu Ala Ala Gly Thr His Ser Ser Pro
        50                  55                  60
Val Pro Gly Ser Ile Gly Val Ala Gly Arg Ser Gln Asp Asp Ala Met
65                  70                  75                  80
Val Asp Tyr Phe Phe Gln Arg Gln His Gly Glu Gln Leu Gly Gly Gly
                85                  90                  95
Gly Ser Gly Gly Gly Gly Tyr Asn Asn Ser Lys His Arg Trp Pro Thr
            100                 105                 110
Gly Asp Asn Ile His Ala Glu His Gln Val Arg Ser Met Asp Glu Leu
        115                 120                 125
Asn His Asp Phe Gln Ala Leu Ala Leu Glu Gly Arg Ala Met Gly Glu
    130                 135                 140
Gln Leu Leu Pro Gly Lys Lys Phe Trp Glu Thr Asp Glu Ser Ser Lys
145                 150                 155                 160
Asp Gly Pro Lys Gly Ile Phe Leu Gly Asp Gln Trp Arg Asp Ser Ala
                165                 170                 175
Trp Gly Thr Ser Asp His Ser Val Ser Gln Pro Ile Met Val Gln Arg
            180                 185                 190
Arg Pro Gly Gln Ser Phe His Val Asn Ser Glu Val Asn Ser Val Leu
        195                 200                 205
Ser Pro Arg Ser Glu Ser Gly Gly Leu Gly Val Ser Met Val Glu Tyr
    210                 215                 220
Val Leu Ser Ser Ser Pro Gly Asp Ser Cys Leu Arg Lys Gly Gly Phe
225                 230                 235                 240
Gly Pro Arg Asp Ala Asp Ser Asp Glu Asn Asp Lys Gly Glu Lys Lys
                245                 250                 255
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Asn Lys Gly Thr Phe Asp Gly Asp Lys Leu Gly Asp Leu Lys Glu Glu
        260   265   270

Gly Asp Val Met Asp Lys Thr Asn Gly Leu Pro Val Gln Asn Gly Ile
        275   280   285

Asp Ala Asp Val Lys Asp Phe Ser Arg Thr Pro Gly Asn Cys Gln Asn
        290   295   300

Ser Ala Asn Glu Val Asp Leu Leu Gly Pro Asn Gln Asn Gly Ser Glu
305   310   315   320

Gly Leu Ala Gln Leu Thr Ser Thr Asn Gly Ala Lys Pro Val Glu Asp
        325   330   335

Phe Ser Asn Met Glu Ser Gln Ser Val Pro Leu Asp Pro Met Glu His
        340   345   350

Val Gly Met Glu Pro Leu Gln Phe Asp Tyr Ser Gly Thr Gln Val Pro
        355   360   365

Val Asp Ser Ala Ala Ala Thr Val Gly Leu Phe Asp Tyr Asn Ser Gln
        370   375   380

Gln Gln Leu Phe Gln Arg Pro Asn Ala Leu Ala Val Gln Gln Leu Thr
385   390   395   400

Ala Ala Gln Gln Gln Gln Tyr Ala Leu Ala Ala Ala His Gln Pro His
        405   410   415

Ile Gly Leu Ala Pro Ala Ala Phe Val Pro Asn Pro Tyr Ile Ile Ser
        420   425   430

Ala Ala Pro Pro Gly Thr Asp Pro Tyr Thr Ala Gly Leu Ala Ala Ala
        435   440   445

Ala Thr Leu Gly Pro Ala Val Val Pro His Gln Tyr Tyr Gly Val Thr
        450   455   460

Pro Trp Gly Val Tyr Pro Ala Ser Leu Phe Gln Gln Gln Ala Ala Ala
465   470   475   480

Ala Ala Ala Ala Thr Asn Ser Ala Asn Gln Gln Thr Thr Pro Gln Ala
        485   490   495

Gln Gln Gly Gln Gln Gln Val Leu Arg Gly Gly Ala Ser Gln Arg Pro
        500   505   510

Leu Thr Pro Asn Gln Asn Gln Gln Gly Gln Gln Thr Asp Pro Leu Val
        515   520   525

Ala Ala Ala Ala Val Asn Ser Ala Leu Ala Phe Gly Gln Gly Leu Ala
        530   535   540

Ala Gly Met Pro Gly Tyr Pro Val Leu Ala Pro Ala Ala Tyr Tyr Asp
545   550   555   560

Gln Thr Gly Ala Leu Val Val Asn Ala Gly Ala Arg Asn Gly Leu Gly
        565   570   575

Ala Pro Val Arg Leu Val Ala Pro Ala Pro Val Ile Ile Ser Ser Ser
        580   585   590

Ala Ala Gln Ala Ala Val Ala Ala Ala Ala Ser Ala Asn Gly Ala
        595   600   605

Ala Gly Gly Leu Ala Gly Thr Thr Asn Gly Pro Phe Arg Pro Leu Gly
        610   615   620

Thr Gln Gln Pro Gln Pro Gln Pro Gln Gln Pro Asn Asn Asn Leu
625   630   635   640

Ala Ser Ser Ser Phe Tyr Gly Asn Asn Ser Leu Asn Ser Asn Ser Gln
        645   650   655

Ser Ser Ser Leu Phe Ser Gln Gly Ser Ala Gln Pro Ala Asn Thr Ser
        660   665   670

Leu Gly Phe Gly Ser Ser Ser Ser Leu Gly Ala Thr Leu Gly Ser Ala
        675   680   685

Leu Gly Gly Phe Gly Thr Ala Val Ala Asn Ser Asn Thr Gly Ser Gly
        690   695   700

Ser Arg Arg Asp Ser Leu Thr Gly Ser Ser Asp Leu Tyr Lys Arg Thr
705   710   715   720

Ser Ser Ser Leu Thr Pro Ile Gly His Ser Phe Tyr Asn Gly Leu Ser

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                                                    735
                           725           730        Ser Gln Gly
Phe Ser Ser Ser Pro Gly Pro Val Gly Met Pro Leu Pro 750
                   740         745
Pro Gly His Ser Gln Thr Pro Pro Pro Ser Leu Ser Ser His Gly Ser
         755             760                     765
Ser Ser Ser Leu Asn Leu Gly Gly Leu Thr Asn Gly Ser Gly Arg Tyr
       770             775                 780
Ile Ser Ala Ala Pro Gly Ala Glu Ala Lys Tyr Arg Ser Ala Ser Ser
785             790                 795                     800
Ala Ser Ser Leu Phe Ser Pro Ser Ser Thr Leu Phe Ser Ser Ser Arg
             805                 810                 815
Leu Arg Tyr Gly Met Ser Asp Val Met Pro Ser Gly Arg Ser Arg Leu
         820                 825                 830
Leu Glu Asp Phe Arg Asn Asn Arg Tyr Pro Asn Leu Gln Leu Arg Glu
         835             840                 845
Ile Ala Gly His Ile Met Glu Phe Ser Gln Asp Gln His Gly Ser Arg
     850             855                 860
Phe Ile Gln Leu Lys Leu Glu Arg Ala Thr Pro Ala Glu Arg Gln Leu
865             870                 875                     880
Val Phe Asn Glu Ile Leu Gln Ala Ala Tyr Gln Leu Met Val Asp Val
             885                 890                 895
Phe Gly Asn Tyr Val Ile Gln Lys Phe Phe Glu Phe Gly Ser Leu Glu
         900             905                 910
Gln Lys Leu Ala Leu Ala Glu Arg Ile Arg Gly His Val Leu Ser Leu
     915                 920                 925
Ala Leu Gln Met Tyr Gly Cys Arg Val Ile Gln Lys Ala Leu Glu Phe
     930             935                 940
Ile Pro Ser Asp Gln Gln Asn Glu Met Val Arg Glu Leu Asp Gly His
945             950                 955                     960
Val Leu Lys Cys Val Lys Asp Gln Asn Gly Asn His Val Val Gln Lys
             965                 970                 975
Cys Ile Glu Cys Val Gln Pro Gln Ser Leu Gln Phe Ile Ile Asp Ala
         980                 985                 990
Phe Lys Gly Gln Val Phe Ala Leu Ser Thr His Pro Tyr Gly Cys Arg
     995                 1000                1005
Val Ile Gln Arg Ile Leu Glu His Cys Leu Pro Asp Gln Thr Leu Pro
     1010                1015                1020
Ile Leu Glu Glu Leu His Gln His Thr Glu Gln Leu Val Gln Asp Gln
1025                1030                1035                1040
Tyr Gly Asn Tyr Val Ile Gln His Val Leu Glu His Gly Arg Pro Glu
             1045                1050                1055
Asp Lys Ser Lys Ile Val Ala Glu Ile Arg Gly Asn Val Leu Val Leu
         1060                1065                1070
Ser Gln His Lys Phe Ala Ser Asn Val Val Glu Lys Cys Val Thr His
     1075                1080                1085
Ala Ser Arg Thr Glu Arg Ala Val Leu Ile Asp Glu Val Cys Thr Met
     1090                1095                1100
Asn Asp Gly Pro His Ser Ala Leu Tyr Thr Met Met Lys Asp Gln Tyr
1105                1110                1115                1120
Ala Asn Tyr Val Val Gln Lys Met Ile Asp Val Ala Glu Pro Gly Gln
             1125                1130                1135
Arg Lys Ile Val Met His Lys Ile Arg Pro His Ile Ala Thr Leu Arg
         1140                1145                1150
Lys Tyr Thr Tyr Gly Lys His Ile Leu Ala Lys Leu Glu Lys Tyr Tyr
     1155                1160                1165
Met Lys Asn Gly Val Asp Leu Gly Pro Ile Cys Gly Pro Pro Asn Gly
     1170                1175                1180
Ile Ile
1185
```

<210> 9
<211> 2112
<212> DNA
<213> Homo sapiens

<220>
<221> CDS
<222> (419)...(1942)
<223> D13645

<400> 9
ggaagttaaa gggaaaaagc aattcacagg aaagagtaca aagacagcac aagaaaaaaa 60
cagatttcat aaaaatagtg attctggttc ttcaaagaca tttccaacaa ggaaagttgc 120
taaagaaggt ggacctaaag tcacatctag gaactttgag aaaagtatca caaaacttgg 180
gaaaaagggt gtaaagcagt tcaagaataa gcagcaaggg gacaaatcac caaagaacaa 240
attccagccg gcaaataaat tcaacaagaa gagaaaattc cagccagatg gtagaagcga 300
tgaatcagca gccaagaagc ccaaatggga tgacttcaaa aagaagaaga aagaactgaa 360
gcaaagcaga caactcagtg ataaaaccaa ctatgacatt gttgttcggg caaagcag 418

atg tgg gag att tta aga aga aaa gac tgt gac aaa gaa aaa aga gta 466
Met Trp Glu Ile Leu Arg Arg Lys Asp Cys Asp Lys Glu Lys Arg Val
1   5   10   15

aag tta atg agt gat ttg cag aag ttg att caa ggg aaa att aaa act 514
Lys Leu Met Ser Asp Leu Gln Lys Leu Ile Gln Gly Lys Ile Lys Thr
            20   25   30

att gca ttt gca cac gat tca act cgt gtg atc cag tgt tac att cag 562
Ile Ala Phe Ala His Asp Ser Thr Arg Val Ile Gln Cys Tyr Ile Gln
        35   40   45

tat ggt aat gaa gaa cag aga aaa cag gct ttt gaa gaa ttg cga gat 610
Tyr Gly Asn Glu Glu Gln Arg Lys Gln Ala Phe Glu Glu Leu Arg Asp
    50   55   60

gat ttg gtt gag tta agt aaa gcc aaa tat tcg aga aat att gtt aag 658
Asp Leu Val Glu Leu Ser Lys Ala Lys Tyr Ser Arg Asn Ile Val Lys
65   70   75   80

aaa ttt ctc atg tat gga agt aaa cca cag att gca gag ata atc aga 706
Lys Phe Leu Met Tyr Gly Ser Lys Pro Gln Ile Ala Glu Ile Ile Arg
                85   90   95

agt ttt aaa ggc cac gtg agg aag atg ctg cgg cat gcg gaa gca tca 754
Ser Phe Lys Gly His Val Arg Lys Met Leu Arg His Ala Glu Ala Ser
            100   105   110

gcc atc gtg gag tac gca tac aat gac aaa gcc att ttg gag cag agg 802
Ala Ile Val Glu Tyr Ala Tyr Asn Asp Lys Ala Ile Leu Glu Gln Arg
        115   120   125

aac atg ctg acg gaa gag ctc tat ggg aac aca ttt cag ctt tac aag 850
Asn Met Leu Thr Glu Glu Leu Tyr Gly Asn Thr Phe Gln Leu Tyr Lys
    130   135   140

tca gca gat cac cga act ctg gac aaa gtg tta gag gta cag cca gaa 898
Ser Ala Asp His Arg Thr Leu Asp Lys Val Leu Glu Val Gln Pro Glu
145   150   155   160

aaa tta gaa ctt att atg gat gaa atg aaa cag att cta act cca atg 946
Lys Leu Glu Leu Ile Met Asp Glu Met Lys Gln Ile Leu Thr Pro Met

```
gcc caa aag gaa gct gtg att aag cac tca ttg gtg cat aaa gta ttc   994
Lys Leu Glu Leu Ile Met Asp Glu Met Lys Gln Ile Leu Thr Pro Met
                165                     170              175


ttg gac ttt ttt acc tat gca ccc ccc aaa ctc aga tca gaa atg att  1042
Ala Gln Lys Glu Ala Val Ile Lys His Ser Leu Val His Lys Val Phe
                180              185              190


gaa gcc atc cgc gaa gcg gtg gtc tac ctg gca cac aca cac gat ggc  1090
Leu Asp Phe Phe Thr Tyr Ala Pro Pro Lys Leu Arg Ser Glu Met Ile
            195              200              205


gcc aga gtg gcc atg cac tgc ctg tgg cat ggc acg ccc aag gac agg  1138
Glu Ala Ile Arg Glu Ala Val Val Tyr Leu Ala His Thr His Asp Gly
        210              215              220


aaa gtg att gtg aaa aca atg aag act tat gtt gaa aag gtg gct aat  1186
Ala Arg Val Ala Met His Cys Leu Trp His Gly Thr Pro Lys Asp Arg
225              230              235              240


ggc caa tac tcc cat ttg gtt tta ctg gcg gca ttt gat tgt att gat  1234
Lys Val Ile Val Lys Thr Met Lys Thr Tyr Val Glu Lys Val Ala Asn
            245              250              255


gat act aag ctt gtg aag cag ata atc ata tca gaa att atc agt tca  1282
Gly Gln Tyr Ser His Leu Val Leu Ala Ala Phe Asp Cys Ile Asp
            260              265              270


ttg cct agc ata gta aat gac aaa tat gga agg aag gtc cta ttg tac  1330
Asp Thr Lys Leu Val Lys Gln Ile Ile Ile Ser Glu Ile Ile Ser Ser
            275              280              285


tta cta agc ccc aga gat cct gca cat aca gta cga gaa atc att gaa  1378
Leu Pro Ser Ile Val Asn Asp Lys Tyr Gly Arg Lys Val Leu Leu Tyr
        290              295              300


gtt ctg caa aaa gga gat gga aat gca cac agt aag aaa gat aca gag  1426
Leu Leu Ser Pro Arg Asp Pro Ala His Thr Val Arg Glu Ile Ile Glu
305              310              315              320


gtc cgc aga cgg gag ctc cta gaa tcc att tct cca gct ttg tta agc  1474
Val Leu Gln Lys Gly Asp Gly Asn Ala His Ser Lys Lys Asp Thr Glu
            325              330              335


tac ctg caa gaa cac gcc caa gaa gtg gtg cta gat aag tct gcg tgt  1522
Val Arg Arg Arg Glu Leu Leu Glu Ser Ile Ser Pro Ala Leu Leu Ser
        340              345              350


gtg ttg gtg tct gac att ctg gga tct gcc act gga gac gtt cag cct  1570
Tyr Leu Gln Glu His Ala Gln Glu Val Val Leu Asp Lys Ser Ala Cys
        355              360              365


acc atg aat gcc atc gcc agc ttg gca gca aca gga ctg cat cct ggt  1618
Val Leu Val Ser Asp Ile Leu Gly Ser Ala Thr Gly Asp Val Gln Pro
370              375              380


ggc aag gac gga gag ctt cac att gca gaa cat cct gca gga cat cta  1666
Thr Met Asn Ala Ile Ala Ser Leu Ala Ala Thr Gly Leu His Pro Gly
```

```
                        390                   395              400
   385
   gtt ctg aag tgg tta ata gag caa gat aaa aag atg aaa gaa aat ggg  1714
   Gly Lys Asp Gly Glu Leu His Ile Ala Glu His Pro Ala Gly His Leu
                       405                 410              415

   aga gaa ggt tgt ttt gca aaa aca ctt gta gag cat gtt ggt atg aag  1762
   Val Leu Lys Trp Leu Ile Glu Gln Asp Lys Lys Met Lys Glu Asn Gly
                   420                 425              430

   aac ctg aag tcc tgg gct agt gta aat cga ggt gcc att att ctt tct  1810
   Arg Glu Gly Cys Phe Ala Lys Thr Leu Val Glu His Val Gly Met Lys
               435                 440              445

   agc ctc ctc cag agt tgt gac ctg gaa gtt gca aac aaa gtc aaa gct  1858
   Asn Leu Lys Ser Trp Ala Ser Val Asn Arg Gly Ala Ile Ile Leu Ser
           450                 455              460

   gca ctg aaa agc ttg att cct aca ctg gaa aaa acc aaa agc acc agc  1906
   Ser Leu Leu Gln Ser Cys Asp Leu Glu Val Ala Asn Lys Val Lys Ala
   465                 470                 475              480

   aaa gga ata gaa att cta ctt gaa aaa ctg agc aca taggtggaaa       1952
   Ala Leu Lys Ser Leu Ile Pro Thr Leu Glu Lys Thr Lys Ser Thr Ser
                   485                 490              495

   gagttaagag caagatggaa tgattttttc tgttctctgt tctgtttccc aatgcagaaa 2012
   Lys Gly Ile Glu Ile Leu Leu Glu Lys Leu Ser Thr
               500                 505

   agaaggggta gggtccacca tactggtaat tggggtactc tgtatatgtg tttcttcttt 2072
   gtatacgaat ctatttatat aaattgtttt tttaaatggt                      2112


   <210> 10
   <211> 508
   <212> PRT
   <213> Homo sapiens


   <400> 10
   Met Trp Glu Ile Leu Arg Arg Lys Asp Cys Asp Lys Glu Lys Arg Val
   1               5                   10                  15
   Lys Leu Met Ser Asp Leu Gln Lys Leu Ile Gln Gly Lys Ile Lys Thr
                   20                  25                  30
   Ile Ala Phe Ala His Asp Ser Thr Arg Val Ile Gln Cys Tyr Ile Gln
               35                  40                  45
   Tyr Gly Asn Glu Glu Gln Arg Lys Gln Ala Phe Glu Glu Leu Arg Asp
           50                  55                  60
   Asp Leu Val Glu Leu Ser Lys Ala Lys Tyr Ser Arg Asn Ile Val Lys
   65                  70                  75                  80
   Lys Phe Leu Met Tyr Gly Ser Lys Pro Gln Ile Ala Glu Ile Ile Arg
                   85                  90                  95
   Ser Phe Lys Gly His Val Arg Lys Met Leu Arg His Ala Glu Ala Ser
                   100                 105                 110
   Ala Ile Val Glu Tyr Ala Tyr Asn Asp Lys Ala Ile Leu Glu Gln Arg
           115                 120                 125
   Asn Met Leu Thr Glu Glu Leu Tyr Gly Asn Thr Phe Gln Leu Tyr Lys
           130                 135                 140
   Ser Ala Asp His Arg Thr Leu Asp Lys Val Leu Glu Val Gln Pro Glu
   145                 150                 155                 160
```

```
Lys Leu Glu Leu Ile Met Asp Glu Met Lys Gln Ile Leu Thr Pro Met
                    165                 170                 175
Ala Gln Lys Glu Ala Val Ile Lys His Ser Leu Val His Lys Val Phe
            180                 185                 190
Leu Asp Phe Phe Thr Tyr Ala Pro Pro Lys Leu Arg Ser Glu Met Ile
        195                 200                 205
Glu Ala Ile Arg Glu Ala Val Val Tyr Leu Ala His Thr His Asp Gly
210                 215                 220
Ala Arg Val Ala Met His Cys Leu Trp His Gly Thr Pro Lys Asp Arg
225             230                 235                     240
Lys Val Ile Val Lys Thr Met Lys Thr Tyr Val Glu Lys Val Ala Asn
                245                 250                 255
Gly Gln Tyr Ser His Leu Val Leu Leu Ala Ala Phe Asp Cys Ile Asp
            260                 265                 270
Asp Thr Lys Leu Val Lys Gln Ile Ile Ile Ser Glu Ile Ile Ser Ser
        275                 280                 285
Leu Pro Ser Ile Val Asn Asp Lys Tyr Gly Arg Lys Val Leu Leu Tyr
    290                 295                 300
Leu Leu Ser Pro Arg Asp Pro Ala His Thr Val Arg Glu Ile Ile Glu
305             310                 315                     320
Val Leu Gln Lys Gly Asp Gly Asn Ala His Ser Lys Lys Asp Thr Glu
            325                 330                 335
Val Arg Arg Arg Glu Leu Leu Glu Ser Ile Ser Pro Ala Leu Leu Ser
        340                 345                 350
Tyr Leu Gln Glu His Ala Gln Glu Val Val Leu Asp Lys Ser Ala Cys
    355                 360                 365
Val Leu Val Ser Asp Ile Leu Gly Ser Ala Thr Gly Asp Val Gln Pro
370                 375                 380
Thr Met Asn Ala Ile Ala Ser Leu Ala Ala Thr Gly Leu His Pro Gly
385             390                 395                     400
Gly Lys Asp Gly Glu Leu His Ile Ala Glu His Pro Ala Gly His Leu
            405                 410                 415
Val Leu Lys Trp Leu Ile Glu Gln Asp Lys Lys Met Lys Glu Asn Gly
        420                 425                 430
Arg Glu Gly Cys Phe Ala Lys Thr Leu Val Glu His Val Gly Met Lys
    435                 440                 445
Asn Leu Lys Ser Trp Ala Ser Val Asn Arg Gly Ala Ile Ile Leu Ser
450                 455                 460
Ser Leu Leu Gln Ser Cys Asp Leu Glu Val Ala Asn Lys Val Lys Ala
465             470                 475                     480
Ala Leu Lys Ser Leu Ile Pro Thr Leu Glu Lys Thr Lys Ser Thr Ser
            485                 490                 495
Lys Gly Ile Glu Ile Leu Leu Glu Lys Leu Ser Thr
            500                 505
```

```
<210> 11
<211> 2457
<212> DNA
<213> Saccharomyces cerevisiae

<220>
<221> CDS
<222> (645)...(1655)
<223> NCA3

<400> 11
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agttgcctgc gagtttctct gcccgaggaa aaagaaatgg aggcaattta cttaatatgg 120
```

```
tatgagagga tcttttgacg gcaaatagat gcgccatctc cgagaaaaaa tctagacaat 180
aacagcgaca attaacctaa agaggataga agatcgagca aaaaatttt ttaatatggg 240
gtcagtggcg atattatact ataggagtta aagagtaagt tgagtgtaag gtggtagaat 300
tatgattgaa ctccgaaact aagcgccgat tatgggtggc aaagcggaca gcttttgata 360
tataatcgat cgctctcgta gttgatatcc tctctcttgc ttatcttttc ctgtatatag 420
tatatgtgta catacagata cgaatatacc tcagttagtt tgttttaaca ttaaatattc 480
aacagttgcc agtagcaaaa agaatatatc cattcattac tttcctttaa tattaaaata 540
                                                                     600
tgatatccaa ctaacagtct cctcatagac ggtaccttac tttcctttaa tattaaaata 600
ctagtatagt cgcacatact taactcgtct ctctctaaca cata atg aaa att tcc 656
                                                     Met Lys Ile Ser
                                                      1
```

```
gca gct tta ata ttg tct tcc ctt tct tct gtc gca ttt tct gcc cct   704
Ala Ala Leu Ile Leu Ser Ser Leu Ser Ser Val Ala Phe Ser Ala Pro
 5             10                  15                  20
```

```
gca cct gct cca gcg gac agt cat cat gaa gat cat cac aaa gat gaa   752
Ala Pro Ala Pro Ala Asp Ser His His Glu Asp His His Lys Asp Glu
                25                  30                  35
```

```
aaa cca gcg gtt gtc act gtc act caa tac ata gat tcc aat gcc gct   800
Lys Pro Ala Val Val Thr Val Thr Gln Tyr Ile Asp Ser Asn Ala Ala
            40                  45                  50
```

```
act agt act gta gaa tct gct gct act acc act aca ttg tcc tca tct   848
Thr Ser Thr Val Glu Ser Ala Ala Thr Thr Thr Thr Leu Ser Ser Ser
            55                  60                  65
```

```
gag aag gat acc tct gaa cag aag cgt gat ggc gga ttc caa gat ggt   896
Glu Lys Asp Thr Ser Glu Gln Lys Arg Asp Gly Gly Phe Gln Asp Gly
        70                  75                  80
```

```
act gtc aaa tgt tcg gac ttc cct tct gta aac ggt ata gtt tcc ttg   944
Thr Val Lys Cys Ser Asp Phe Pro Ser Val Asn Gly Ile Val Ser Leu
 85                  90                  95                 100
```

```
gac tgg cta gga ttt ggt gga tgg gcc tct gtc atg gac atg gat gcc   992
Asp Trp Leu Gly Phe Gly Gly Trp Ala Ser Val Met Asp Met Asp Ala
                105                 110                 115
```

```
aac act tcg tcc gaa tgt aag gat ggc tac tac tgt tct tat gca tgt  1040
Asn Thr Ser Ser Glu Cys Lys Asp Gly Tyr Tyr Cys Ser Tyr Ala Cys
                120                 125                 130
```

```
gaa cct gga atg tca aag act caa tgg cct tct gac caa cca agc gat  1088
Glu Pro Gly Met Ser Lys Thr Gln Trp Pro Ser Asp Gln Pro Ser Asp
            135                 140                 145
```

```
ggt aaa tct gtt ggt ggt ctt tat tgt aaa aat ggt tac ttg tac cgt  1136
Gly Lys Ser Val Gly Gly Leu Tyr Cys Lys Asn Gly Tyr Leu Tyr Arg
            150                 155                 160
```

```
acc aac act gat acc agc gat tta tgt tct acg gat gaa aca tct gct  1184
Thr Asn Thr Asp Thr Ser Asp Leu Cys Ser Thr Asp Glu Thr Ser Ala
165                 170                 175                 180
```

```
aag gcc att aac aaa aag tct gac tcc att gct cta tgt agg acg gat  1232
Lys Ala Ile Asn Lys Lys Ser Asp Ser Ile Ala Leu Cys Arg Thr Asp
            185                 190                 195
```

```
tac cca gga tct gaa aac atg gtg att ccc aca gtg gtt gat ggt gga    1280
Tyr Pro Gly Ser Glu Asn Met Val Ile Pro Thr Val Val Asp Gly Gly
            200                 205                 210

gat tca caa cca att tca gtc gtt gat gaa gac act tat tat caa tgg    1328
Asp Ser Gln Pro Ile Ser Val Val Asp Glu Asp Thr Tyr Tyr Gln Trp
            215                 220                 225

cag ggt aaa aag act tct gct cag tac tat att aac aac gcc ggt gta    1376
Gln Gly Lys Lys Thr Ser Ala Gln Tyr Tyr Ile Asn Asn Ala Gly Val
        230                 235                 240

tct gca gaa gat ggg tgc att tgg ggt act tct ggt tcg gat gtc ggc    1424
Ser Ala Glu Asp Gly Cys Ile Trp Gly Thr Ser Gly Ser Asp Val Gly
245                 250                 255                 260

aac tgg gct cca cta gtg tta ggt gct ggt tcc act aat gga gaa aca    1472
Asn Trp Ala Pro Leu Val Leu Gly Ala Gly Ser Thr Asn Gly Glu Thr
                265                 270                 275

tac ttg tcg ttg att cca aac ccc aac agt aac caa gct gcc aac ttt    1520
Tyr Leu Ser Leu Ile Pro Asn Pro Asn Ser Asn Gln Ala Ala Asn Phe
            280                 285                 290

aac gtt aaa ata gtt gca tcc gat ggc gct aac gtt cag ggc agc tgt    1568
Asn Val Lys Ile Val Ala Ser Asp Gly Ala Asn Val Gln Gly Ser Cys
        295                 300                 305

gcg tat gaa gat ggc tct ttc acc gga gat ggt tcc gat ggt tgc aca    1616
Ala Tyr Glu Asp Gly Ser Phe Thr Gly Asp Gly Ser Asp Gly Cys Thr
    310                 315                 320

gtt tct gtt tta tct gga tct gct gaa ttt gtt ttc tat taagtcactc     1665
Val Ser Val Leu Ser Gly Ser Ala Glu Phe Val Phe Tyr
325                 330                 335
```

```
ttcttttcgg taaaagaatg tcttgtattt tgataccctc aattcccctt attattcttt 1725
ttcttccgct ctctatttat tattatacat tgggattccg ttatattttt ctcctttcag 1785
ttcattttac ttcttaaaaa gtttcgttga tcgctattat gctatggatt caaagatttt 1845
cttttctctc tcttcaaggt gtactctgca ttacggtttt ctttagttcg tttatttttt 1905
ttttgttaac aaggtgtttg tatacatata tataaatata tggaaatatt atagtgttta 1965
ttttgttact tcctgcgagt tgcaacagaa ctaacaagat gccatgctgt ttttttttcat 2025
tttttggcta taaaaataac agtatcctag tccttgtgtt cggctttaaa atggaattgc 2085
aaaccccata attccttctt cacaccgaac aaaatttcct taagcgtgct atcgaatgag 2145
ctaatgcttt gaatataatt tttttcttca ccgtatttgc cgctgcttct aatattttttg 2205
tagacatcaa tcaagagttt catggtctcc tcgataatgc cacttttttac atatacacga 2265
gagtgtagca tagcccaatc aatcaaatct aaatttttcat cagtacttaa tgtcatgtta 2325
cgacaaccca cagtagtaac actcatgact aaatttttcat cagtacttaa tgtcatgtta 2385
ggggctaacg aaatcaatgc aatgggcgtt tctctataaa cgatgatatg cgtattgttc 2445
accactggat cc                                                      2457
```

<210> 12
<211> 337
<212> PRT
<213> Saccharomyces cerevisiae

<400> 12
Met Lys Ile Ser Ala Ala Leu Ile Leu Ser Ser Leu Ser Ser Val Ala

```
    1                    5                        10                          15
    Phe Ser Ala Pro Ala Pro Ala Pro Ala Asp Ser His His Glu Asp His
                    20                        25                  30
    His Lys Asp Glu Lys Pro Ala Val Val Thr Val Thr Gln Tyr Ile Asp
                35                        40                  45
    Ser Asn Ala Ala Thr Ser Thr Val Glu Ser Ala Ala Thr Thr Thr Thr
            50                        55                  60
    Leu Ser Ser Ser Glu Lys Asp Thr Ser Glu Gln Lys Arg Asp Gly Gly
    65                        70                  75                  80
    Phe Gln Asp Gly Thr Val Lys Cys Ser Asp Phe Pro Ser Val Asn Gly
                        85                  90                  95
    Ile Val Ser Leu Asp Trp Leu Gly Phe Gly Gly Trp Ala Ser Val Met
                    100                     105                 110
    Asp Met Asp Ala Asn Thr Ser Ser Glu Cys Lys Asp Gly Tyr Tyr Cys
                115                     120                 125
    Ser Tyr Ala Cys Glu Pro Gly Met Ser Lys Thr Gln Trp Pro Ser Asp
                130                     135                 140
    Gln Pro Ser Asp Gly Lys Ser Val Gly Gly Leu Tyr Cys Lys Asn Gly
    145                     150                 155                 160
    Tyr Leu Tyr Arg Thr Asn Thr Asp Thr Ser Asp Leu Cys Ser Thr Asp
                    165                     170                 175
    Glu Thr Ser Ala Lys Ala Ile Asn Lys Lys Ser Asp Ser Ile Ala Leu
                180                     185                 190
    Cys Arg Thr Asp Tyr Pro Gly Ser Glu Asn Met Val Ile Pro Thr Val
                195                     200                 205
    Val Asp Gly Gly Asp Ser Gln Pro Ile Ser Val Val Asp Glu Asp Thr
            210                     215                 220
    Tyr Tyr Gln Trp Gln Gly Lys Lys Thr Ser Ala Gln Tyr Tyr Ile Asn
    225                     230                 235                 240
    Asn Ala Gly Val Ser Ala Glu Asp Gly Cys Ile Trp Gly Thr Ser Gly
                        245                 250                 255
    Ser Asp Val Gly Asn Trp Ala Pro Leu Val Leu Gly Ala Gly Ser Thr
                    260                     265                 270
    Asn Gly Glu Thr Tyr Leu Ser Leu Ile Pro Asn Pro Asn Ser Asn Gln
                275                     280                 285
    Ala Ala Asn Phe Asn Val Lys Ile Val Ala Ser Asp Gly Ala Asn Val
            290                     295                 300
    Gln Gly Ser Cys Ala Tyr Glu Asp Gly Ser Phe Thr Gly Asp Gly Ser
    305                     310                 315                 320
    Asp Gly Cys Thr Val Ser Val Leu Ser Gly Ser Ala Glu Phe Val Phe
                    325                     330                 335
    Tyr
```

```
aatgcgtcct caaaacgtta gtttagtcgt gctcaaccgc tattttggt tttatcttcg 240
tttctttctc ctgaacgaca ttcgtcacga aaattgcggc ggaaaatttc ctgatgcgga 300
cacttttcc cgatccggac atgcctttt ttggcgtttc gcgtcagtca atagaagttt 360
cagatctaca ttaggaagaa ccagaaaata gccattaatg ctttcagcat agcacagcat 420
agcagctgtg tatatcttaa ataagatgta gactggtttg catttggaaa ggttttgtgt 480
aagaaaagca atacttgagg taaaacaaga gaaaaaaaaa cactttacta actaatatcc 540
aatcctttat tttttgcag aa atg aaa ttc tca act gcc gtt act acg ttg 592
                       Met Lys Phe Ser Thr Ala Val Thr Thr Leu
                        1             5                      10
```

```
att agt tct ggt gcc atc gtg tct gct tta cca cac gtg gat gtt cac   640
Ile Ser Ser Gly Ala Ile Val Ser Ala Leu Pro His Val Asp Val His
              15                  20                  25
```

```
caa gaa gat gcc cac caa cat aag agg gcc gtt gcg tac aaa tac gtt   688
Gln Glu Asp Ala His Gln His Lys Arg Ala Val Ala Tyr Lys Tyr Val
              30                  35                  40
```

```
tac gaa act gtt gtt gtc gat tct gat ggc cac act gta act cct gct   736
Tyr Glu Thr Val Val Val Asp Ser Asp Gly His Thr Val Thr Pro Ala
          45                  50                  55
```

```
gct tca gaa gtc gct act gct gct acc tct gct atc att aca aca tct   784
Ala Ser Glu Val Ala Thr Ala Ala Thr Ser Ala Ile Ile Thr Thr Ser
      60                  65                  70
```

```
gtg ttg gct cca acc tcc tcc gca gcc gct ggg ata gcc gct tcc att   832
Val Leu Ala Pro Thr Ser Ser Ala Ala Ala Gly Ile Ala Ala Ser Ile
  75                  80                  85                  90
```

```
gct gtt tca tct gct gcc tta gcc aag aat gag aaa atc tct gat gcc   880
Ala Val Ser Ser Ala Ala Leu Ala Lys Asn Glu Lys Ile Ser Asp Ala
              95                 100                 105
```

```
gct gca tct gcc act gcc tca aca tct caa ggg gca tcc tcc tcc tcc   928
Ala Ala Ser Ala Thr Ala Ser Thr Ser Gln Gly Ala Ser Ser Ser Ser
          110                 115                 120
```

```
tcc tcc tcc tcg gca act tct acc cta gaa agc agc tct gtt tct tca   976
Ser Ser Ser Ser Ala Thr Ser Thr Leu Glu Ser Ser Ser Val Ser Ser
      125                 130                 135
```

```
tct agt gaa gaa gct gct cca aca tct act gtc gtg tca act tct tcc  1024
Ser Ser Glu Glu Ala Ala Pro Thr Ser Thr Val Val Ser Thr Ser Ser
  140                 145                 150
```

```
gca acc caa tct agt gct tct tct gcc act aaa tct agt act tct tcc  1072
Ala Thr Gln Ser Ser Ala Ser Ser Ala Thr Lys Ser Ser Thr Ser Ser
155                 160                 165                 170
```

```
act tca cca tct act tct act tct act tcc act tct tct act tcc tct  1120
Thr Ser Pro Ser Thr Ser Thr Ser Thr Ser Thr Ser Ser Thr Ser Ser
              175                 180                 185
```

```
tcc tct tcc tcc tcc tcc tcc tct tct tct tct tct tct ggc agt ggt  1168
Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Gly Ser Gly
          190                 195                 200
```

```
agt atc tac ggt gat ttg gcc gac ttt tca ggc cca agt gag aaa ttc  1216
```

```
Ser Ile Tyr Gly Asp Leu Ala Asp Phe Ser Gly Pro Ser Glu Lys Phe
        205                 210                 215

caa gac ggc act att cca tgt gac aaa ttc cca tct ggt caa ggt gtc   1264
Gln Asp Gly Thr Ile Pro Cys Asp Lys Phe Pro Ser Gly Gln Gly Val
        220                 225                 230

att tct att gac tgg att ggc gag ggt gga tgg tcc ggt gtg gaa aac   1312
Ile Ser Ile Asp Trp Ile Gly Glu Gly Gly Trp Ser Gly Val Glu Asn
235                 240                 245                 250

acc gac act tcc act ggc ggt tca tgc aag gag ggg tcc tac tgt tcc   1360
Thr Asp Thr Ser Thr Gly Gly Ser Cys Lys Glu Gly Ser Tyr Cys Ser
                255                 260                 265

tac tcc tgc caa cca ggt atg tct aag acc caa tgg cca tcc gat caa   1408
Tyr Ser Cys Gln Pro Gly Met Ser Lys Thr Gln Trp Pro Ser Asp Gln
            270                 275                 280

cca tct gac ggt aga tct gtc ggg ggt ttg ttg tgt aaa aat ggt tat   1456
Pro Ser Asp Gly Arg Ser Val Gly Gly Leu Leu Cys Lys Asn Gly Tyr
            285                 290                 295

ttg tac cgt tct aac act gac gcg gat tac tta tgt gaa tgg ggt gtc   1504
Leu Tyr Arg Ser Asn Thr Asp Ala Asp Tyr Leu Cys Glu Trp Gly Val
        300                 305                 310

gag gct gcc tat gtt gtt tct aaa cta agc aag ggt gtc gcc att tgc   1552
Glu Ala Ala Tyr Val Val Ser Lys Leu Ser Lys Gly Val Ala Ile Cys
315                 320                 325                 330

aga acc gac tac ccg ggc act gaa aac atg gtt atc cca acc tat gtt   1600
Arg Thr Asp Tyr Pro Gly Thr Glu Asn Met Val Ile Pro Thr Tyr Val
                335                 340                 345

gaa ggg ggt agc tct ttg cca ttg acc gtt gtt gac caa gat act tac   1648
Glu Gly Gly Ser Ser Leu Pro Leu Thr Val Val Asp Gln Asp Thr Tyr
                350                 355                 360

ttt act tgg gaa ggc aaa aag aca tct gct caa tac tac gtt aat aac   1696
Phe Thr Trp Glu Gly Lys Lys Thr Ser Ala Gln Tyr Tyr Val Asn Asn
            365                 370                 375

gcc ggc gtc tca gtt gaa gat ggg tgt atc tgg ggt act tct gga tct   1744
Ala Gly Val Ser Val Glu Asp Gly Cys Ile Trp Gly Thr Ser Gly Ser
        380                 385                 390

ggt att ggt aac tgg gca cca tta aac ttt ggt gct ggc tcc act ggt   1792
Gly Ile Gly Asn Trp Ala Pro Leu Asn Phe Gly Ala Gly Ser Thr Gly
395                 400                 405                 410

gga gtg aca tac tta tca ttg att cct aac cca aac aac agc gac gca   1840
Gly Val Thr Tyr Leu Ser Leu Ile Pro Asn Pro Asn Asn Ser Asp Ala
                415                 420                 425

ttg aac tac aac gtc aag ata gtt gct gct gat gat tca tcc aat gtc   1888
Leu Asn Tyr Asn Val Lys Ile Val Ala Ala Asp Asp Ser Ser Asn Val
                430                 435                 440
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atc ggt gaa tgt gtt tac gaa aat ggt gag ttc tct ggc ggt gct gac    1936
Ile Gly Glu Cys Val Tyr Glu Asn Gly Glu Phe Ser Gly Gly Ala Asp
        445                   450                   455

ggg tgt acc gtc tct gtt act tcc ggt aaa gct cat ttc gtc tta tac    1984
Gly Cys Thr Val Ser Val Thr Ser Gly Lys Ala His Phe Val Leu Tyr
460                   465                   470

aat taagctacgt gactactact tttccttttt tttttctttt ttcgaacaca         2037
Asn
475

tctcaccccc tatacctcac acaatcacta tggtcccctt ttcttttttac cgatatttat 2097
actgtccacc tttttctttt cgttaatggc ctcaatgttt ctgtaccatt atc        2150


<210> 14
<211> 475
<212> PRT
<213> Saccharomyces cerevisiae

<400> 14
Met Lys Phe Ser Thr Ala Val Thr Thr Leu Ile Ser Ser Gly Ala Ile
1               5                   10                  15
Val Ser Ala Leu Pro His Val Asp Val His Gln Glu Asp Ala His Gln
            20                  25                  30
His Lys Arg Ala Val Ala Tyr Lys Tyr Val Tyr Glu Thr Val Val Val
        35                  40                  45
Asp Ser Asp Gly His Thr Val Thr Pro Ala Ala Ser Glu Val Ala Thr
    50                  55                  60
Ala Ala Thr Ser Ala Ile Ile Thr Thr Ser Val Leu Ala Pro Thr Ser
65                  70                  75                  80
Ser Ala Ala Ala Gly Ile Ala Ala Ser Ile Ala Val Ser Ser Ala Ala
                85                  90                  95
Leu Ala Lys Asn Glu Lys Ile Ser Asp Ala Ala Ala Ser Ala Thr Ala
            100                 105                 110
Ser Thr Ser Gln Gly Ala Ser Ser Ser Ser Ser Ser Ser Ser Ala Thr
        115                 120                 125
Ser Thr Leu Glu Ser Ser Ser Val Ser Ser Ser Ser Glu Glu Ala Ala
    130                 135                 140
Pro Thr Ser Thr Val Val Ser Thr Ser Ser Ala Thr Gln Ser Ser Ala
145                 150                 155                 160
Ser Ser Ala Thr Lys Ser Ser Thr Ser Ser Thr Ser Pro Ser Thr Ser
                165                 170                 175
Thr Ser Thr Ser Thr Ser Ser Thr Ser Ser Ser Ser Ser Ser Ser Ser
            180                 185                 190
Ser Ser Ser Ser Ser Ser Ser Gly Ser Gly Ser Ile Tyr Gly Asp Leu
        195                 200                 205
Ala Asp Phe Ser Gly Pro Ser Glu Lys Phe Gln Asp Gly Thr Ile Pro
    210                 215                 220
Cys Asp Lys Phe Pro Ser Gly Gln Gly Val Ile Ser Ile Asp Trp Ile
225                 230                 235                 240
Gly Glu Gly Gly Trp Ser Gly Val Glu Asn Thr Asp Thr Ser Thr Gly
                245                 250                 255
Gly Ser Cys Lys Glu Gly Ser Tyr Cys Ser Tyr Ser Cys Gln Pro Gly
            260                 265                 270
Met Ser Lys Thr Gln Trp Pro Ser Asp Gln Pro Ser Asp Gly Arg Ser
        275                 280                 285
Val Gly Gly Leu Leu Cys Lys Asn Gly Tyr Leu Tyr Arg Ser Asn Thr
    290                 295                 300
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Asp Ala Asp Tyr Leu Cys Glu Trp Gly Val Glu Ala Ala Tyr Val Val
305   310   315   320
Ser Lys Leu Ser Lys Gly Val Ala Ile Cys Arg Thr Asp Tyr Pro Gly
                    325   330   335
Thr Glu Asn Met Val Ile Pro Thr Tyr Val Glu Gly Gly Ser Ser Leu
                340   345   350
Pro Leu Thr Val Val Asp Gln Asp Thr Tyr Phe Thr Trp Glu Gly Lys
            355   360   365
Lys Thr Ser Ala Gln Tyr Tyr Val Asn Asn Ala Gly Val Ser Val Glu
        370   375   380
Asp Gly Cys Ile Trp Gly Thr Ser Gly Ser Gly Ile Gly Asn Trp Ala
385   390   395   400
Pro Leu Asn Phe Gly Ala Gly Ser Thr Gly Gly Val Thr Tyr Leu Ser
                405   410   415
Leu Ile Pro Asn Pro Asn Asn Ser Asp Ala Leu Asn Tyr Asn Val Lys
                420   425   430
Ile Val Ala Ala Asp Asp Ser Ser Asn Val Ile Gly Glu Cys Val Tyr
            435   440   445
Glu Asn Gly Glu Phe Ser Gly Gly Ala Asp Gly Cys Thr Val Ser Val
        450   455   460
Thr Ser Gly Lys Ala His Phe Val Leu Tyr Asn
465   470   475

<210> 15
<211> 145
<212> PRT
<213> Saccharomyces cerevisiae

<220>
<221> VARIANT
<222> (1)...(145)
<223> Xaa = Any Amino Acid

<400> 15
Thr Asp Tyr Pro Gly Xaa Glu Asn Met Val Xaa Pro Thr Xaa Val Xaa
1   5   10   15
Xaa Gly Xaa Ser Xaa Pro Xaa Xaa Val Xaa Xaa Xaa Asp Xaa Tyr Xaa
                20   25   30
Xaa Trp Xaa Gly Lys Lys Thr Ser Ala Gln Tyr Tyr Xaa Asn Asn Xaa
        35   40   45
Gly Val Ser Xaa Glu Asp Gly Cys Ile Trp Gly Thr Xaa Gly Ser Xaa
        50   55   60
Xaa Gly Asn Trp Ala Pro Xaa Xaa Xaa Gly Ala Xaa Xaa Thr Xaa Gly
65   70   75   80
Xaa Thr Tyr Leu Ser Xaa Ile Pro Asn Pro Asn Xaa Xaa Xaa Ala Xaa
                85   90   95
Asn Xaa Asn Xaa Lys Ile Val Ala Xaa Asp Xaa Xaa Xaa Xaa Val Xaa
            100   105   110
Gly Xaa Cys Xaa Tyr Glu Xaa Gly Xaa Xaa Xaa Gly Xaa Gly Xaa Asp
        115   120   125
Gly Cys Thr Val Ser Val Xaa Ser Gly Xaa Ala Xaa Phe Val Xaa Tyr
        130   135   140
Xaa
145

<210> 16
<211> 60

<212> PRT
<213> Saccharomyces cerevisiae

<400> 16
Ser Leu Ile Pro Asn Pro Asn Asn Gly Asn Ala Leu Asn Phe Asn Val
1   5   10   15
Lys Ile Val Ala Ala Asp Asp Ser Ser Thr Val Asn Gly Glu Cys Ile
            20   25   30
Tyr Glu Asn Gly Ser Phe Ser Ser Gly Gly Ser Asp Gly Cys Thr Val
        35   40   45
Ser Val Thr Ala Gly Lys Ala Lys Phe Val Leu Tyr
    50   55   60

<210> 17
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 17
Leu Ala Thr Asp Gln Phe Gly Cys Arg Phe Leu Gln Lys Lys Leu Glu
1   5   10   15

<210> 18
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 18
Leu Ile Leu Asp Pro Phe Gly Asn Tyr Leu Val Asp Lys Ile Cys Asp
1   5   10   15

<210> 19
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 19
Ile Ser Ile Asn Gln Tyr Gly Thr Arg Ser Leu Gln Lys Ile Ile Asp
1   5   10   15

<210> 20
<211> 15
<212> PRT
<213> Saccharomyces cerevisiae

<400> 20
Leu Ile Asn Asp Ile Asn Gly His Val Ile Gln Lys Cys Ile Phe
1   5   10   15

<210> 21
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 21
Ile Ser Thr His Lys His Gly Cys Cys Val Leu Gln Lys Ile Leu Ser
1   5   10   15

<210> 22
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 22
Leu Ile Asn Asp Gln Phe Gly Asn Tyr Ile Ile Gln Phe Ile Leu Asp
1   5   10   15

<210> 23
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 23
Leu Ser Cys Leu Lys Phe Ser Ser Asn Val Val Glu Lys Phe Ile Lys
1   5   10   15

<210> 24
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 24
Leu Ile Arg Asp Asn Phe Gly Asn Tyr Ala Leu Gln Thr Leu Leu Asp
1   5   10   15

<210> 25
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 25
Leu Cys Lys Asp Gln His Gly Cys Arg Phe Leu Gln Lys Gln Leu Asp
1   5   10   15

<210> 26
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 26
Leu Met Thr Asp Ser Phe Gly Asn Tyr Leu Ile Gln Lys Leu Leu Glu
1   5   10   15

<210> 27
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 27
Ile Ser Leu Asn Pro His Gly Thr Arg Ala Leu Gln Lys Leu Ile Glu
1   5   10   15

<210> 28
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 28
Leu Ser Lys Asp Leu Asn Gly Asn His Val Ile Gln Lys Cys Leu Gln
1   5   10   15

<210> 29
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 29
Ile Ala Thr His Arg His Gly Cys Cys Val Leu Gln Arg Cys Leu Asp
1   5   10   15

<210> 30
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 30
Leu Thr Leu Asp Pro Phe Gly Asn Tyr Val Val Gln Tyr Ile Ile Thr
1   5   10   15

<210> 31
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 31
Leu Ser Ile His Lys Phe Gly Ser Asn Val Ile Glu Lys Ile Ile Lys
1   5   10   15

<210> 32
<211> 16
<212> PRT
<213> Saccharomyces cerevisiae

<400> 32
Leu Leu Asn Asp Ser Tyr Gly Asn Tyr Val Leu Gln Thr Ala Leu Asp
1   5   10   15

<210> 33
<211> 16
<212> PRT
<213> Drosophila

<400> 33
Phe Ser Gln Asp Gln His Gly Ser Arg Phe Ile Gln Gln Lys Leu Glu
1   5   10   15

<210> 34
<211> 16
<212> PRT
<213> Drosophila

<400> 34
Leu Met Thr Asp Val Phe Gly Asn Tyr Val Ile Gln Lys Phe Phe Glu
1   5   10   15

<210> 35
<211> 16
<212> PRT
<213> Drosophila

<400> 35
Leu Ala Leu Gln Met Tyr Gly Leu Arg Val Ile Gln Lys Ala Leu Glu
1   5   10   15

<210> 36
<211> 16
<212> PRT
<213> Drosophila

<400> 36
Cys Val Lys Asp Gln Asn Gly Asn His Val Val Gln Lys Cys Ile Glu
1   5   10   15

<210> 37
<211> 16
<212> PRT
<213> Drosophila

<400> 37
Leu Ser Thr His Pro Tyr Gly Cys Arg Val Ile Gln Arg Ile Leu Glu
1   5   10   15

<210> 38
<211> 16
<212> PRT
<213> Drosophila

<400> 38
Leu Ile Gln Asp Gln Tyr Gly Asn Tyr Val Ile Gln His Val Leu Glu
1   5   10   15

<210> 39
<211> 16
<212> PRT
<213> Drosophila

<400> 39
Leu Ser Gln His Lys Phe Ala Ser Asn Val Val Glu Lys Cys Val Thr
1   5   10   15

<210> 40
<211> 16
<212> PRT
<213> Drosophila

<400> 40
Met Met Lys Asp Gln Tyr Ala Asn Tyr Val Val Gln Lys Met Ile Asp
1   5   10   15

<210> 41
<211> 16
<212> PRT
<213> Homo sapiens

<400> 41
Phe Ser Gln Asp Gln His Gly Ser Arg Phe Ile Gln Leu Lys Leu Glu
1   5   10   15

<210> 42
<211> 16
<212> PRT
<213> Homo sapiens

<400> 42
Leu Met Arg Asp Val Phe Gly Asn Tyr Val Ile Gln Lys Phe Phe Glu
1   5   10   15

<210> 43
<211> 16
<212> PRT
<213> Homo sapiens

<400> 43
Leu Ala Leu Gln Met Tyr Gly Leu Arg Val Ile Gln Lys Ala Leu Glu
1   5   10   15

<210> 44
<211> 16
<212> PRT
<213> Homo sapiens

<400> 44
Cys Val Lys Asp Gln Asn Gly Asn His Val Val Gln Lys Cys Ile Glu
1   5   10   15

<210> 45
<211> 16
<212> PRT
<213> Homo sapiens

<400> 45
Leu Ser Thr His Pro Tyr Gly Cys Arg Val Ile Gln Arg Ile Leu Glu
1   5   10   15

<210> 46
<211> 16
<212> PRT
<213> Homo sapiens

<400> 46
Leu Val Gln Asp Gln Tyr Gly Asn Tyr Val Ile Gln His Val Leu Glu
1   5   10   15

<210> 47
<211> 16
<212> PRT
<213> Homo sapiens

<400> 47
Val Leu Ser Gln His Phe Ala Ser Asn Val Val Glu Lys Cys Val Thr
1   5   10   15

<210> 48
<211> 16
<212> PRT
<213> Homo sapiens

<400> 48
Met Met Lys Asp Gln Tyr Ala Asn Tyr Val Val Gln Lys Met Ile Asp
1   5   10   15